OPEN SESAME

Book 4

Environmental Studies

Eleanor Watts

SKM-1549

Open Sesame

Environmental Studies

Book 4

(Science)

ELEANOR WATTS

Orient Longman

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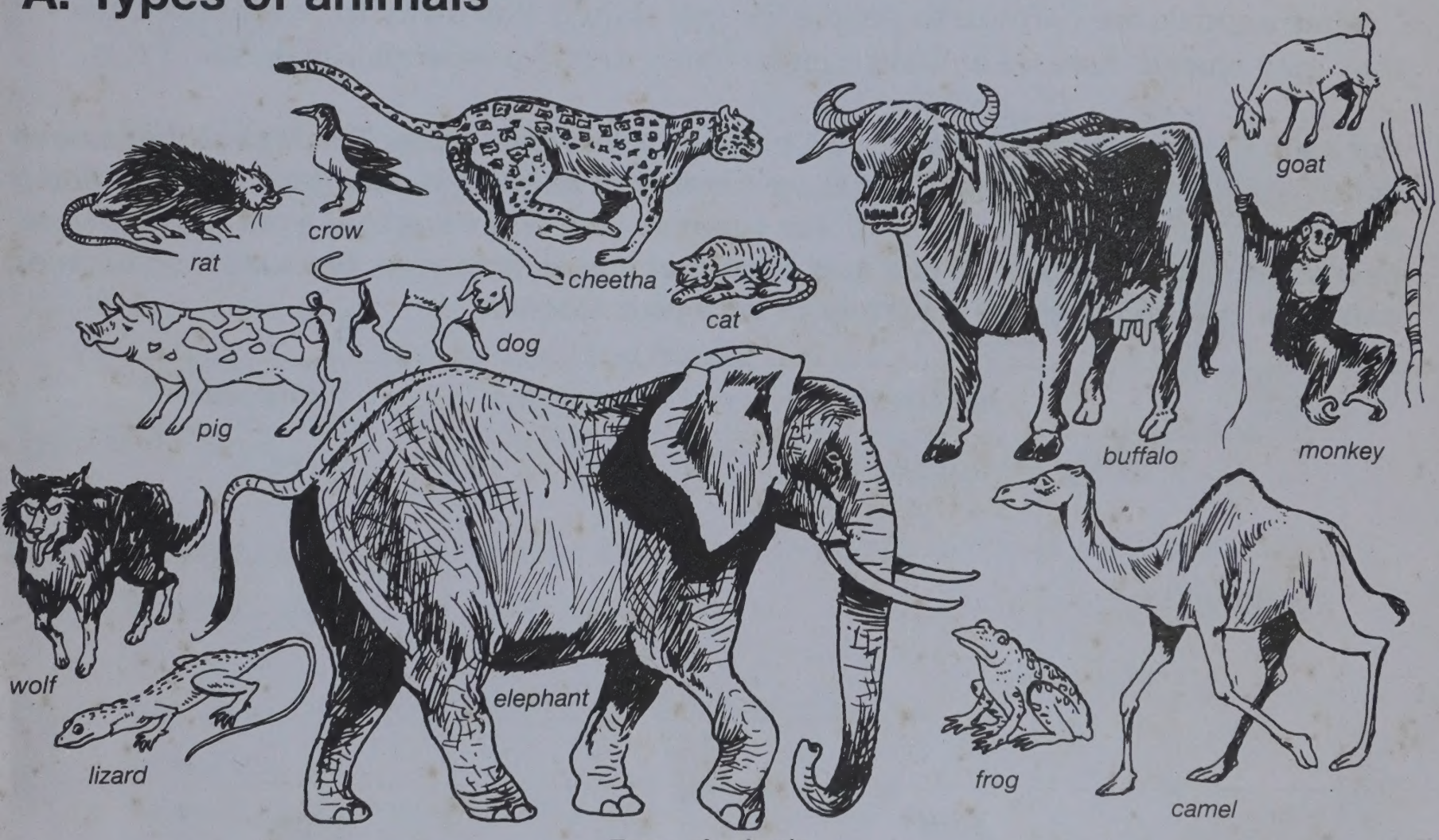
UNIT 1

Animals in our Lives

Key words

conserve : to protect
feeler : thread-like part on an insect's head used for touching and feeling things
fuel : material used for producing heat by burning
injection : medicine which is put into the body by a special needle
litter : thrown away waste or unwanted matter
pesticide : a poison which kills harmful animals or insects
survey : to look and collect information

A. Types of animals



Types of animals

Here are some common animals. These animals can be grouped in different ways:

FOOD HABITS

Different animals eat different types of food. Some animals feed on plants, trees, fruit and seeds. These animals are called *herbivores*. For example, squirrels and goats are herbivores.

Some animals feed on the meat of other animals. These animals are called *carnivores*. For example, dogs, lizards are carnivores.

Animals that feed on both plants and meat are called *omnivore*. For example,pigs and rats are omnivores.

DOMESTIC AND WILD ANIMALS

Some animals are called *domestic*. People feed and look after domestic animals. For example, dogs and pigs are domestic animals.

Some animals are *wild*. People do not feed or look after them. These animals find their own food and cannot be tamed easily. For example, lions and tigers are wild animals.

USEFUL AND HARMFUL ANIMALS

Some animals are very useful to people. They give milk, meat, leather, etc. They pull carts and plough fields; for example, cows and horses do this.

Some animals are harmful to people. People should stay away from them because they may spread diseases and also can be dangerous, for example, snakes and rats.

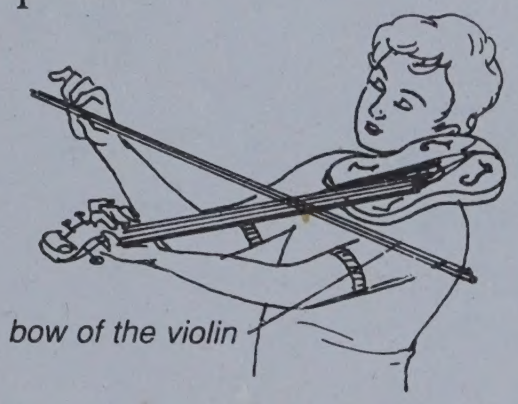
Put each of the animals in the picture on page 1 into this table. The first six have been done for you. You will not have the same number of animals in each box. You may find it difficult to decide which box is right. For example, you may think that a cat is a carnivore, because it likes meat best or you may think that it is an omnivore, because it sometimes eats rice. Talk about it with a partner or with your teacher.

	herbivores	**carnivores**	**omnivores**
wild	*squirrel*	*lizard*	*rat*
domestic	*goat*	*dog*	*pig*

B. How animals help us

Some animals help us in many different ways. You all know that cats kill mice and rats. But did you know that the stomach of the cat is used for making a special kind of thread? This is called *cat gut*.

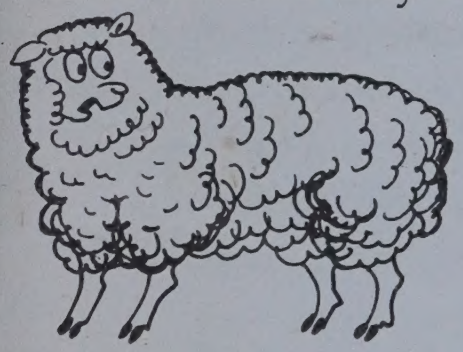
Cat gut is sometimes used when a doctor has to sew stitches in a deep cut.



bow of the violin

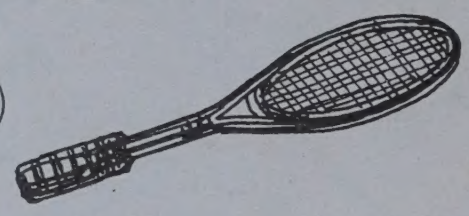
You all know that horses are used for pulling carts and tongas, but did you know that the hairs from a horse's tail are used to make the bow for a violin?

You all know that we get meat from pigs. But did you also know that pigs help to keep streets clean because they eat the litter?



Did you know?

The strings of a tennis racket can be made from the intestines of sheep.



Write two sentences about the uses of these animals, following this pattern :

We get milk from goats. We also get meat.

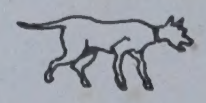
1. Cats catch ..... .
   We also get .....from their stomachs.

2. Horses pull ..... .
   We also use the hairs from their tails to ..... .

3. We get ..... from pigs.
   They also .....

4. We get ..... from chickens.
   We also get ..... from them.

5. Dogs ..... .
   We also .....



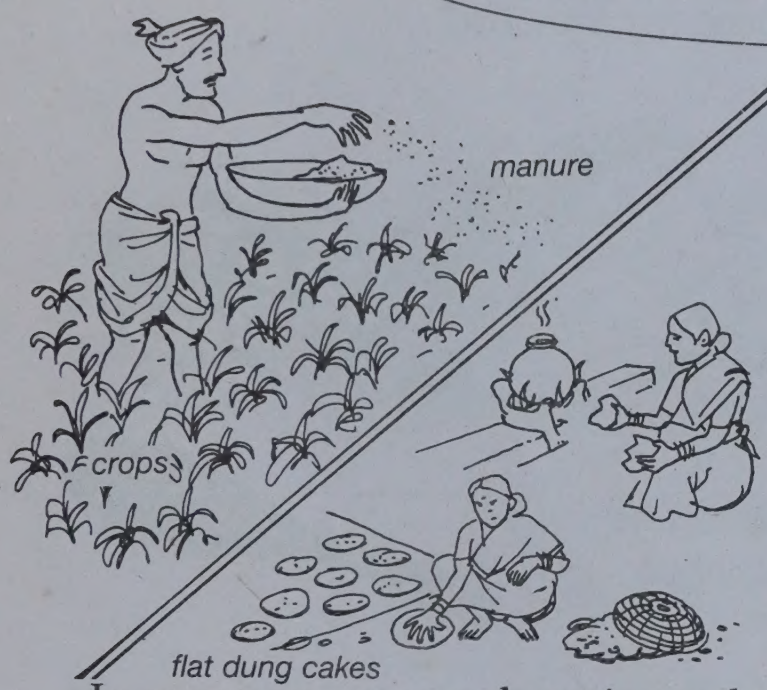
6. We get ..... from sheep.
   We also get ..... .

C. The uses of cattle

Cattle are cows, bulls and buffaloes. Cattle help us in many ways. We get milk from cows and female buffaloes. and from milk we can make butter, ghee, curd and cheese. Male cattle are used for pulling carts and ploughing fields. After they die, their skin is used for making leather.

Did you know?

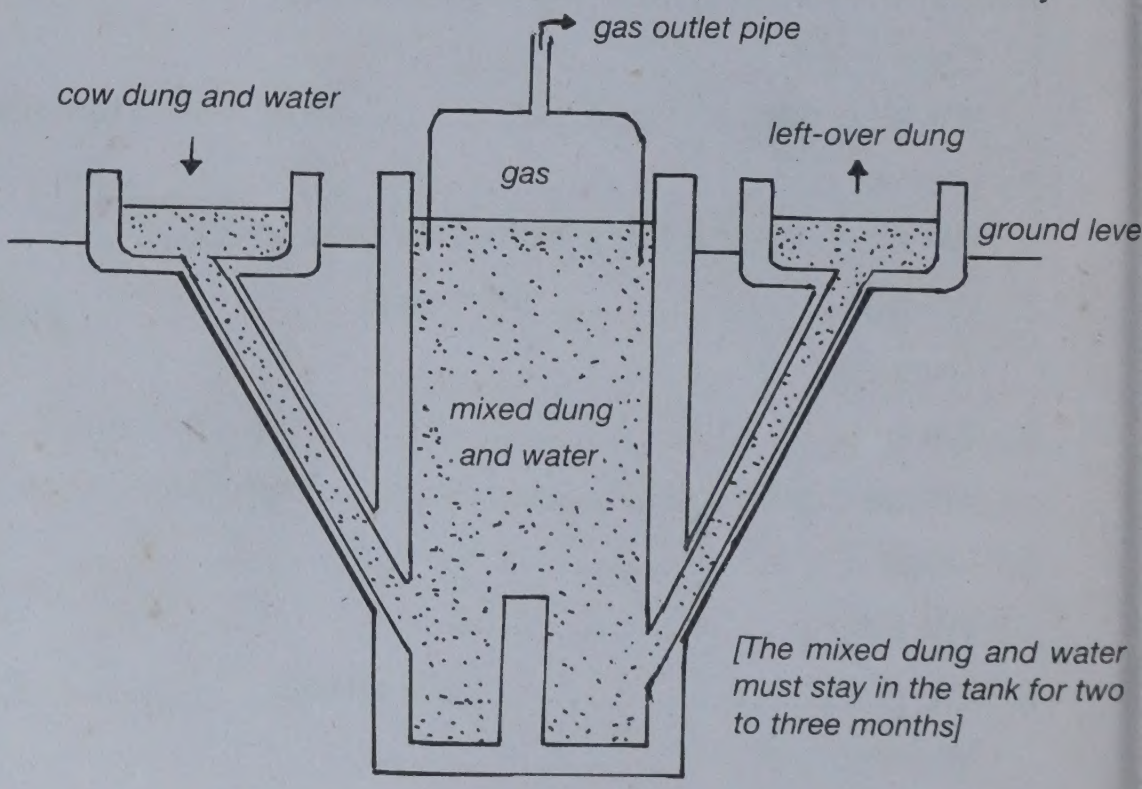
A quarter of the cattle in the world live in India.



A cow's waste matter is called *dung*. We use dung in many ways. If we spread it over the fields as manure, it makes the soil good, so that the crops grow well. Many people use dung as a fuel. They make it into flat cakes and dry it in the sun. These cakes are then used as fuel for cooking. If possible, it is best to use other fuels for cooking, so that dung can be used for the fields. Dung is the best *natural fertiliser*.

In many areas, cow dung is used to make floors smooth. It is mixed with water and spread over the floor. When it is dry, it smells sweet and keeps away insects for many days.

Dung is also used to make *gobar gas*. Gobar gas can be used as fuel for cooking. This picture shows how a gobar gas plant works. Dung is mixed with water. Gas comes off the mixture and collects in the metal dome. Pipes take the gas to people's stoves. The left-over dung then comes out at the other side. This can be used to fertilise fields.



A gobar gas plant

Though dung is very useful, you should always wash your hands after you have touched it. Never put it on a cut as it contains germs.

Find eleven different products or uses of cattle and their dung in this word search. The words may be written horizontally, vertically or diagonally. Two have been done for you.

X	F	O	N	B	Y	P	F	L	O	O	R	P
C	S	K	F	U	E	L	V	S	R	D	G	L
H	U	P	L	T	M	O	S	L	M	N	O	O
E	L	R	R	I	J	A	T	D	E	B	B	U
E	M	L	D	U	N	G	N	A	A	C	A	G
S	P	I	N	J	I	H	H	U	T	W	R	H
E	G	Q	L	A	M	I	Z	E	R	O	G	I
F	E	V	H	K	U	N	U	Y	E	E	A	N

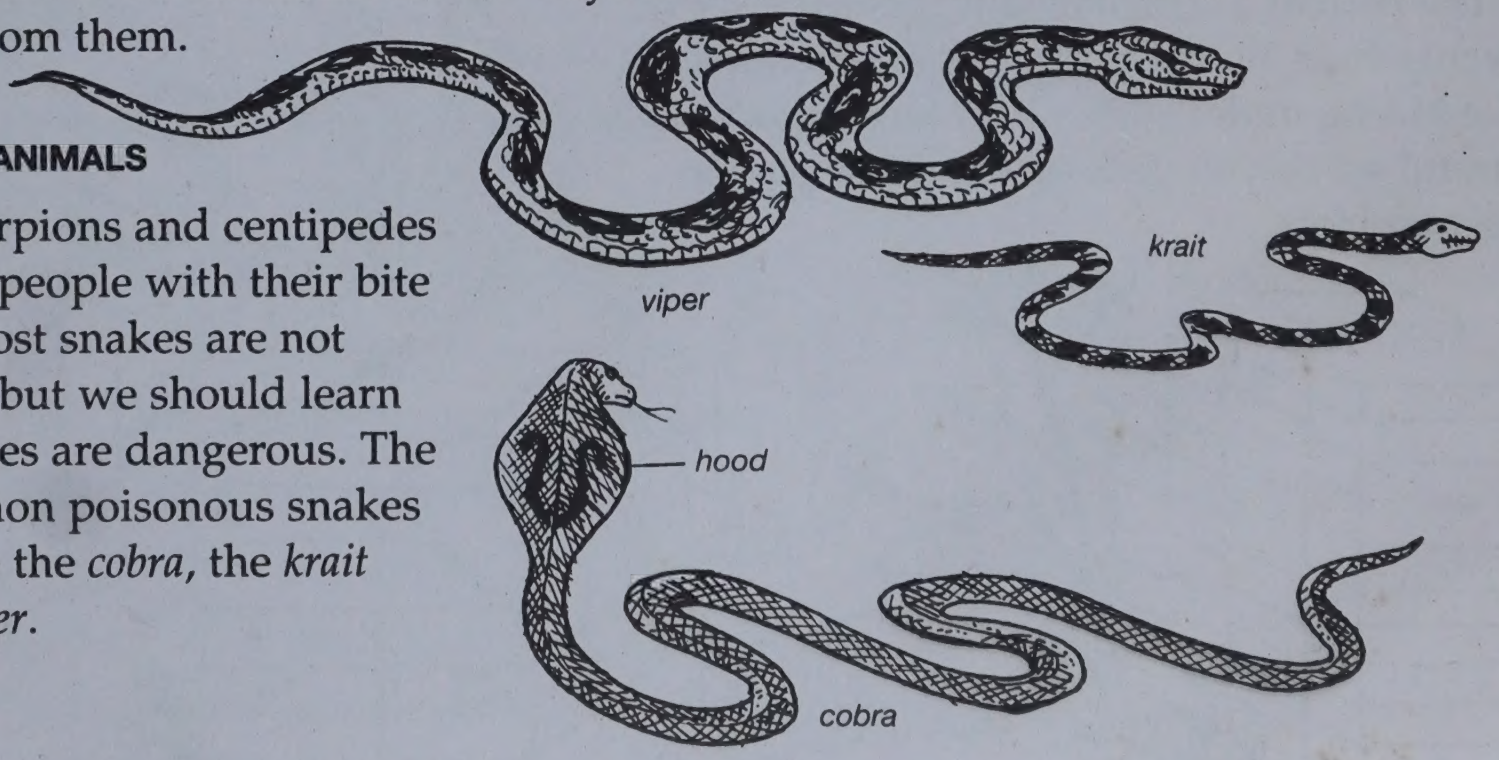
P U L L I N G C A R T S G

D. How animals can harm us

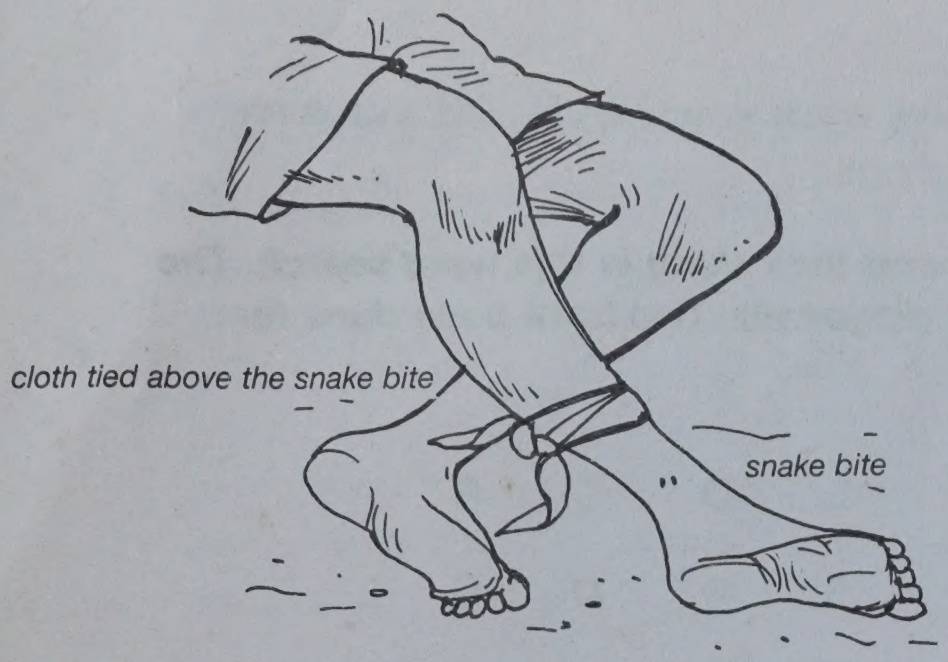
In this lesson we will think about the ways some animals can harm us and how we can keep safe from them.

POISONOUS ANIMALS

Snakes, scorpions and centipedes can poison people with their bite or sting. Most snakes are not poisonous, but we should learn which snakes are dangerous. The most common poisonous snakes in India are the *cobra*, the *krait* and the *viper*.

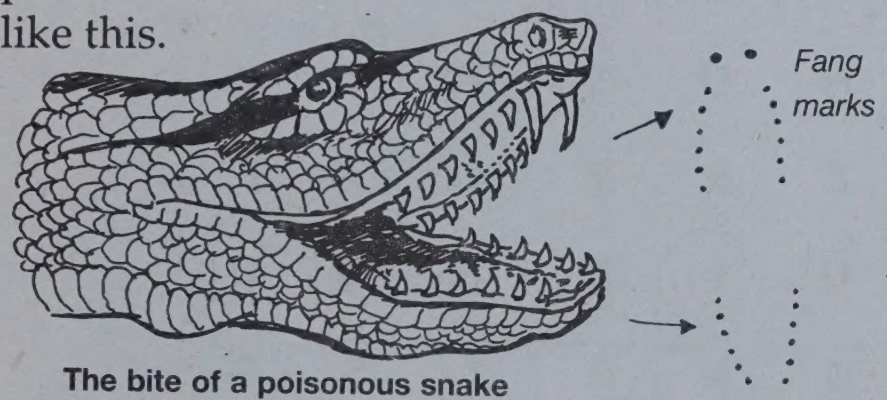


Poisonous snakes

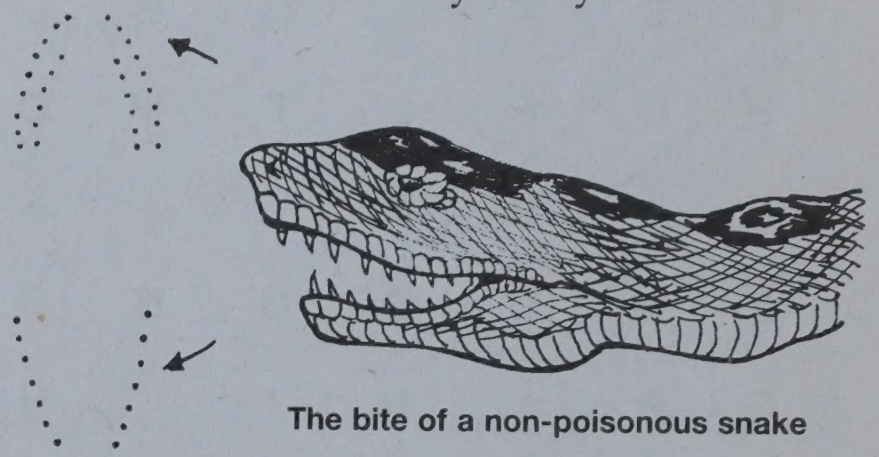


If you are bitten by one of these snakes, you should go to the nearest hospital at once for an *injection*. If you do not have an injection in two or three hours, you may die. Try to keep still while you are travelling to hospital. You may also tie a cloth quite tightly above the part which has been bitten, but remember to loosen it for a few seconds every thirty minutes.

You can usually tell whether you have been bitten by a poisonous snake by looking at the teeth marks. If a snake is not poisonous, it leaves a row of teeth marks like this.



The bite of a poisonous snake



The bite of a non-poisonous snake

A poisonous snake has two poison fangs, so it leaves two deep teeth marks when it bites.

The bite of a scorpion or centipede is very painful. Still , it does not usually kill people unless they are young children or very weak. If a scorpion or centipede stings you, take a strong pain-killer like aspirin. You can also go to a hospital for an injection.

The pain of a scorpion sting lasts for about twenty-four hours. Scorpions and centipedes like hiding under stones or in deep grass, so be careful when you pick up stones or play in bushy places.

ANIMALS WHICH CARRY DISEASE

Some animals are harmful because they *carry disease*. Rats and mice carry harmful germs because they live in dirty places. A rat bite can be dangerous. Keep your kitchen clean and store food in a cupboard with a tight door. This will keep out rats.

Rabies is very dangerous illness caused by some animal bites. Dogs, cats, monkeys and rats may have rabies. If one of these animals bites or scratches you, you must go to the doctor at once for some injections. If you have been bitten by an animal with rabies and don't have the anti-rabies injections, you may die.

ANIMALS WHICH CAN ATTACK US

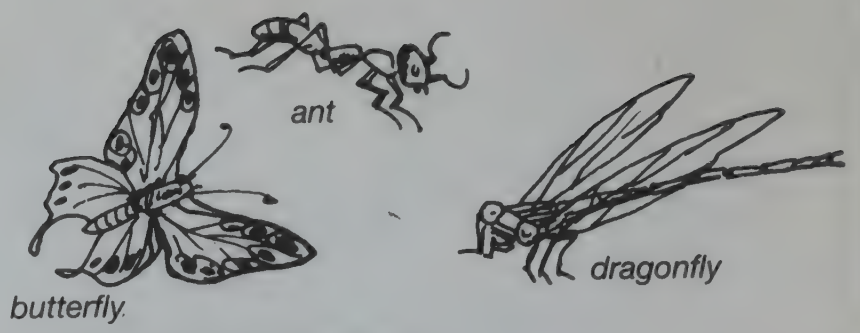
Large wild animals like tigers, leopards, panthers and wolves can be dangerous if you are by yourself in the jungle. They usually run away from people, but they may attack if they are teased or if they are very hungry. Female animals will attack anyone who might be dangerous to their babies. Don't go into jungles by yourself. Never tease an animal—even small animals can hurt you if you frighten them.

Answer these questions :

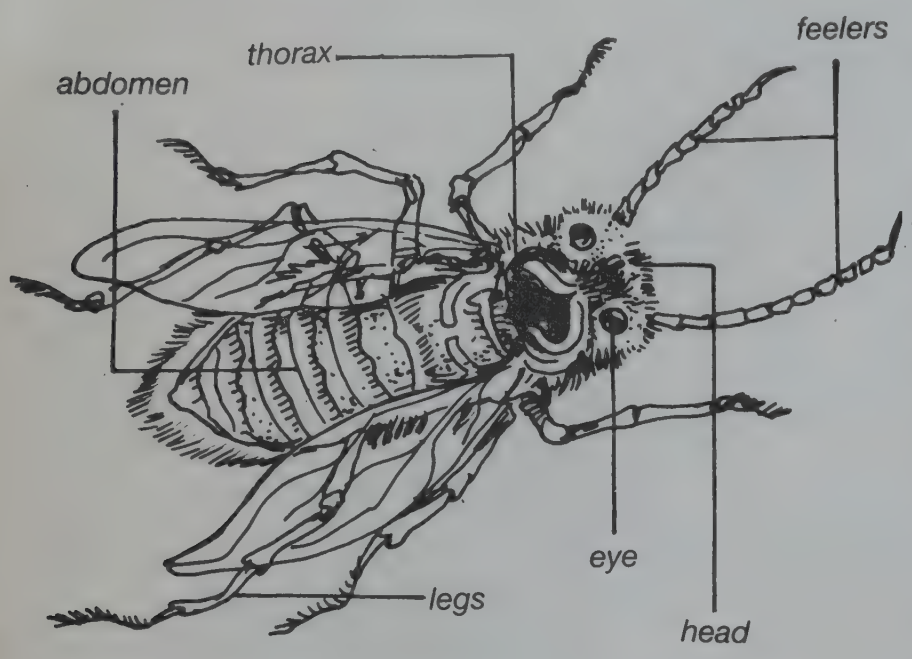
1. Which dangerous snake has stripes across its body?
2. Which dangerous snake has a hood?
3. How can you tell if you have been bitten by a poisonous snake?
4. What should you do if you are bitten by a poisonous snake?
5. What kind of person might die from a scorpion sting?
6. Where do scorpions and centipedes hide?
7. Why should you keep rats away from your food?
8. What should you do if you are bitten by a strange dog?
9. Give three reasons to explain why wild animals sometimes attack people.

E. Insects

Insects can be found everywhere on land. They live all over the earth and in fact there are more insects on earth than any other animals. About eight out of every ten animals are insects.



Some insects



Body parts of an insect

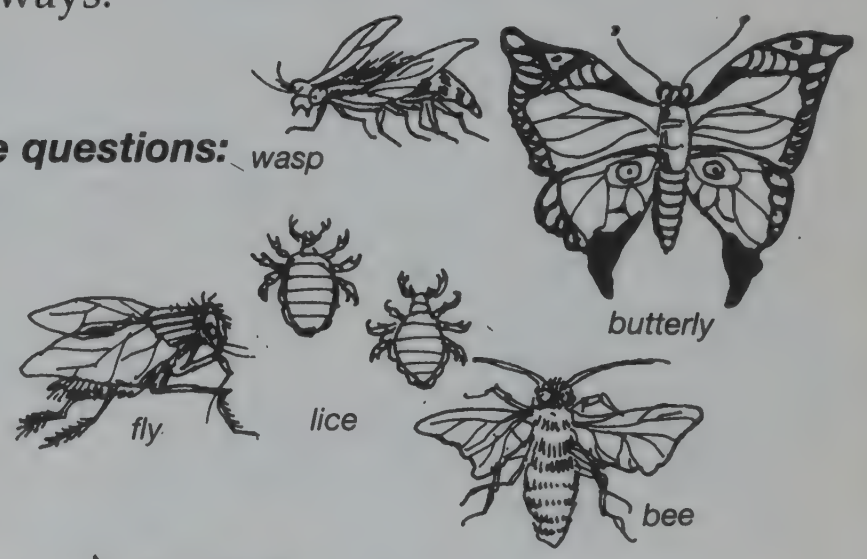
The body of an insect is divided into three parts.

The front part is the *head* which has eyes and *feelers*. The middle part is called the *thorax* and the back part of the body is the *abdomen*. All insects have six *jointed legs* and a hard outer covering. Any animal that has more than six legs is not an insect.

Insects do not have bones. Some insects have wings and some don't. Wasps, bees, ants, butterflies, beetles and flies are all insects. Many people dislike insects, but insects also help us in many ways.

Look at the pictures given and answer these questions:

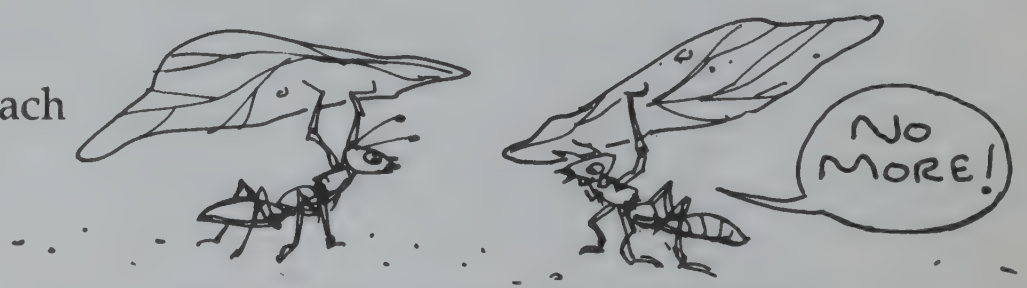
1. Which of these insects like dirty places?
2. Which of these insects like flowers?
3. Which insects make our heads itch?
4. Which of these insects can fly?
5. Which of these insects can sting?



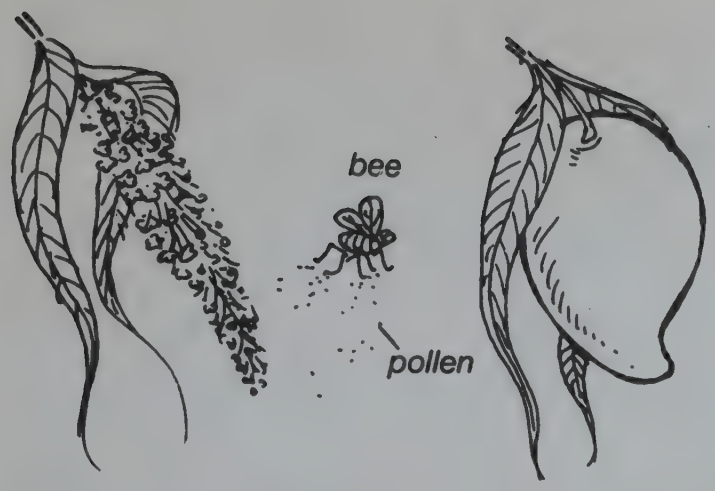
F. Useful insects

Ants and beetles eat up dead and rotting animals and plants. They keep the ground clean. The first picture here shows a dead cockroach. The second picture shows what is left of the cockroach in the morning—the ants have eaten the rest.

a cockroach at 11 p.m.

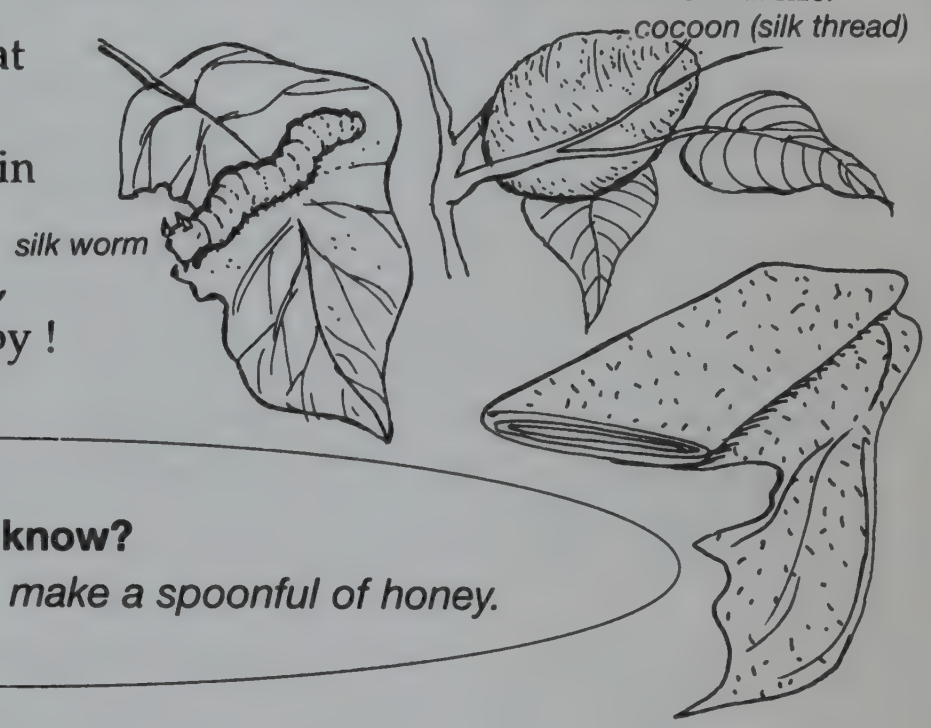


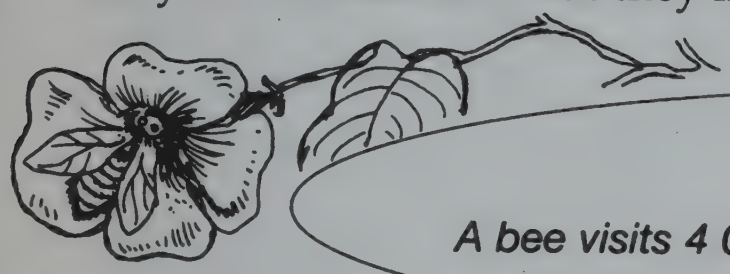
the same cockroach, the next morning at 6 a.m.



Some insects like bees and butterflies go from flower to flower to collect *nectar* which is a sweet juice inside the flower. While doing so, they carry the *pollen* – a yellow dust – along with them. The pollen from one flower helps the fruit of another flower of the same type to grow. Without insects we would not have much fruit.

Bees also make honey. Most of us love to eat honey because it is so sweet. Silkworms (which hatch out of the eggs of silkmoth) spin long silk threads which we can weave into cloth. Though butterflies are not very useful, they are so beautiful that they make us happy !





Did you know?

A bee visits 4 000 flowers to make a spoonful of honey.

Write these sentences in the correct order.

The pollen from the first flower helps the fruit of another flower to grow.
Nectar is a sweet juice inside flowers.
So without insects, we would not have fruit.
They take the pollen to another flower of the same type.
Insects come to flowers for the nectar.
They pick up pollen from one flower.

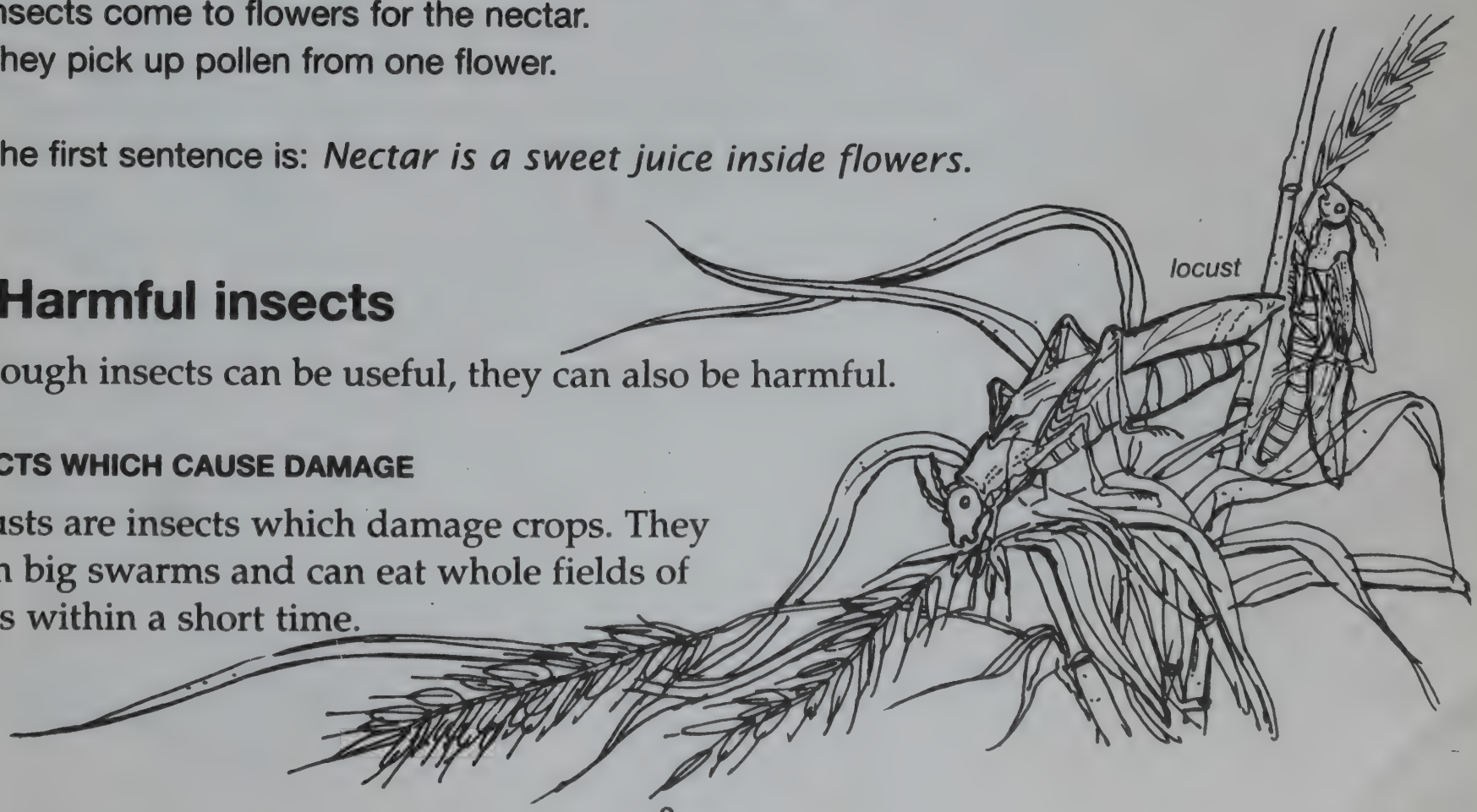
The first sentence is: *Nectar is a sweet juice inside flowers.*

G. Harmful insects

Although insects can be useful, they can also be harmful.

INSECTS WHICH CAUSE DAMAGE

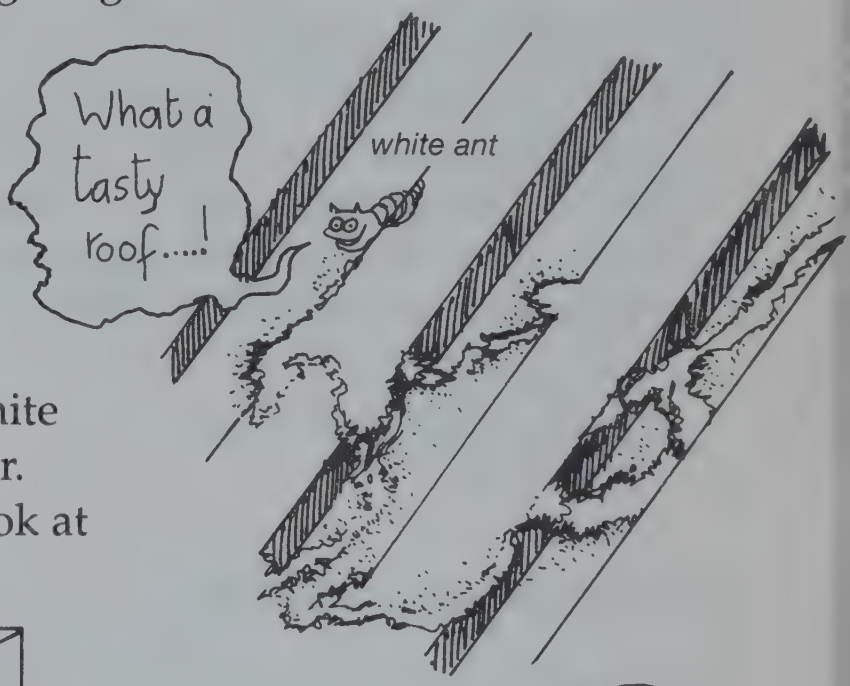
Locusts are insects which damage crops. They fly in big swarms and can eat whole fields of crops within a short time.



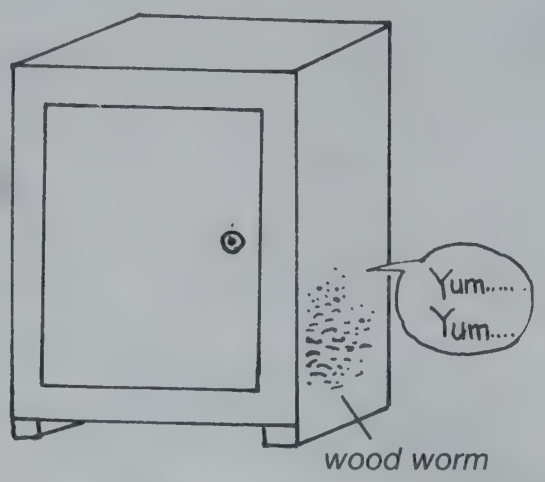
Some kinds of beetles eat crops too. Here is a picture of a beetle eating a brinjal plant.

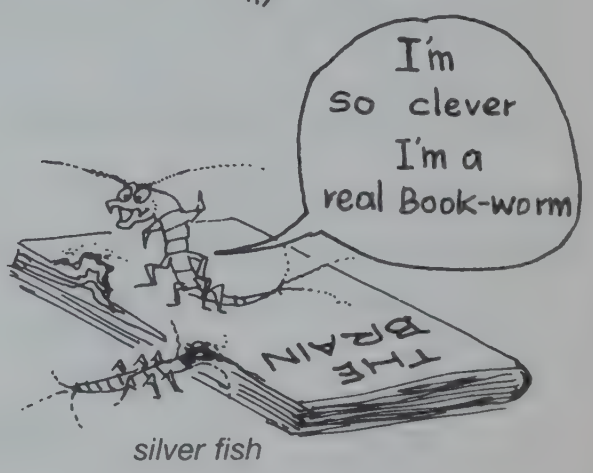
Some farmers kill these beetles with poisons called *pesticides*. Pesticides may kill the beetles but they can be dangerous. The poison goes into the soil and kills the good insects as well as the harmful ones. Also the poison goes into the animals which eat those insects. Sometimes the poison goes into the vegetables we eat. Nowadays, scientists are finding natural ways of controlling beetles.

Some insects eat crops after they come from the field. Weevils eat rice, wheat and other grains. If you put the grain in the sun, the weevils usually go away because they don't like bright light.



Woodworm, silver fish, white ants and moths damage things in our houses. Woodworm and white ants eat wood. Silver fish and white ants eat paper. Moths eat clothes in dark cupboards or boxes. Look at the damage they have done!

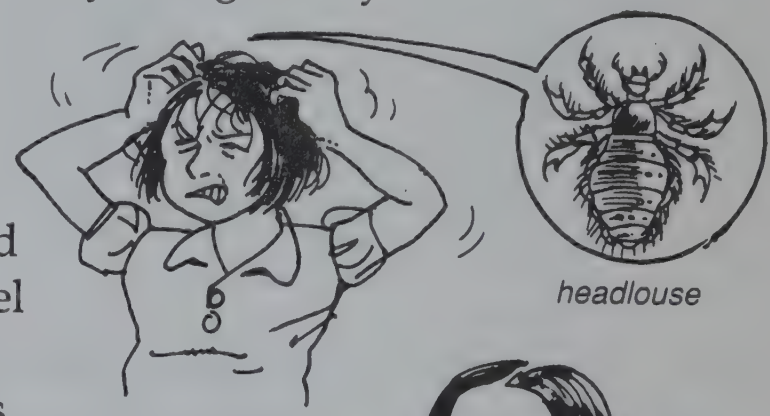




You can stop these insects from damaging your houses if you rub kerosene on wooden things and dust them often. Naphthalene balls or neem leaves keep away moths, white ants and silver fish.

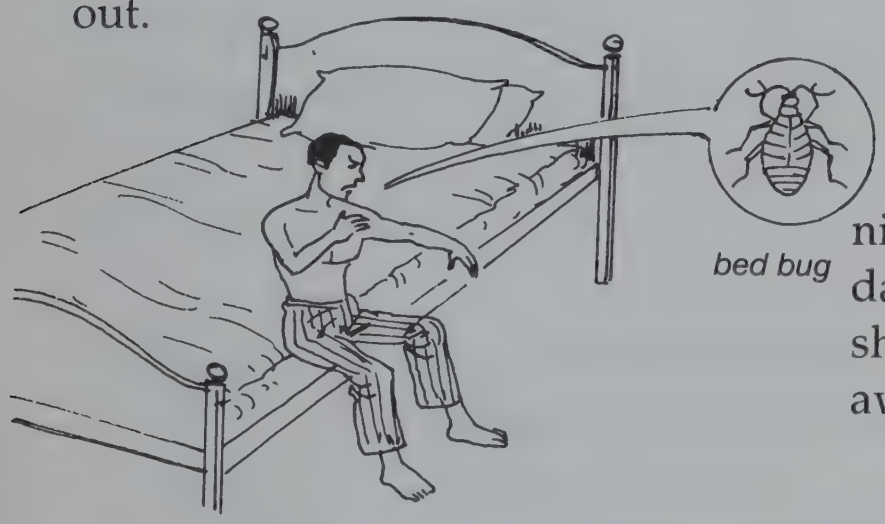
INSECTS WHICH CARRY DISEASE

Cockroaches and flies carry germs because they live on dirty things. They also like food. So they bring germs from unclean things and make the food dirty. This is why we should always cover food after we have finished cooking. We should also keep our houses clean. If the cockroaches and flies can't find anything to eat, they will go away !



BLOOD SUCKING INSECTS

Some insects suck our blood. Headlice take blood from our heads under our hair. They make us feel very itchy. You can kill headlice with special shampoo. Everyone in the family should use this shampoo. You can also mix kerosene with hair oil and leave it on your head for one hour. Then wash it out.



Bedbugs live in bedding. They bite people at night, then hide inside the bedding in the daytime so that you cannot see them. We should put bedding and beds in the sun to keep away bedbugs.

Mosquitoes are the most dangerous blood sucking insects. Some mosquitoes can give us *malaria*. When you get malaria, you have a high fever and feel very weak. Mosquitoes can give us other diseases too. You can keep away mosquitoes in different ways. The pictures on the next page show you some of the ways.

Let's go out for dinner tonight.
No luck here. We can't get in.
1
2
Help! I'm choking Let's get out of here.
3
Nice fat boy. But we can't get at him.
4
Pooh, what a smell. He's put some of that horrible cream on!
5
Dinner at last!
6

Mosquitoes lay their eggs in still water, so cover up puddles, water pots and water tanks. Try to keep your surroundings clean.

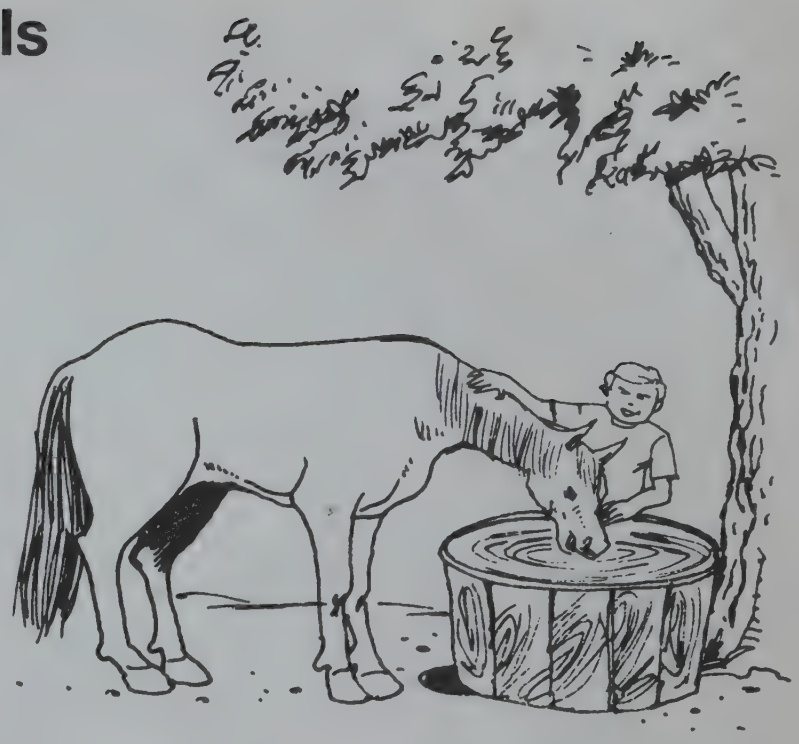
INSECTS WHICH STING

Some insects like bees, wasps and ants can sting you. Keep away from these insects. Never try to get honey from a bees' nest by yourself.

Match the two parts of these sentences :

1. Locusts	eat rice and wheat grains.
2. Beetles	suck blood and live in bedding.
3. Weevils	swarm on crops and eat them.
4. Woodworm and white ants	carry germs from dirty things.
5. Silver fish and white ants	sometimes eat crops.
6. Moths	eat wooden things.
7. Cockroaches and flies	suck blood and can carry malaria.
8. Headlice	can sting us.
9. Bedbugs	eat cloth.
10. Mosquitoes	eat books and paper.
11. Bees, wasps and ants	suck blood from our heads.

M. Looking after domestic animals



It is very important to look after domestic animals well. We should feed them regularly and give them clean water. We should make sheds and fences to protect them against the sun, rain, cold and other animals. We should keep their surroundings clean. Dirty animals carry disease. We should clean up their waste. We have already learnt that it is good to use animal dung on the fields or for gobar gas. It is also important to be kind to animals. Like us, they have feelings. We should never beat animals in our care.

Most animals need *vaccinations* when they are young. Vaccinations are injections which protect them from disease. If you have an animal, ask the vet (or animal doctor) what injections it needs. The vet can also give it medicines for worms and other diseases.

For homework, do a survey about the care of domestic animals. Find a friend or relative who keeps a domestic animal. This might be a dog, a cat, a cow, a buffalo or sheep. If they have more than one animal, ask questions about any one of them.

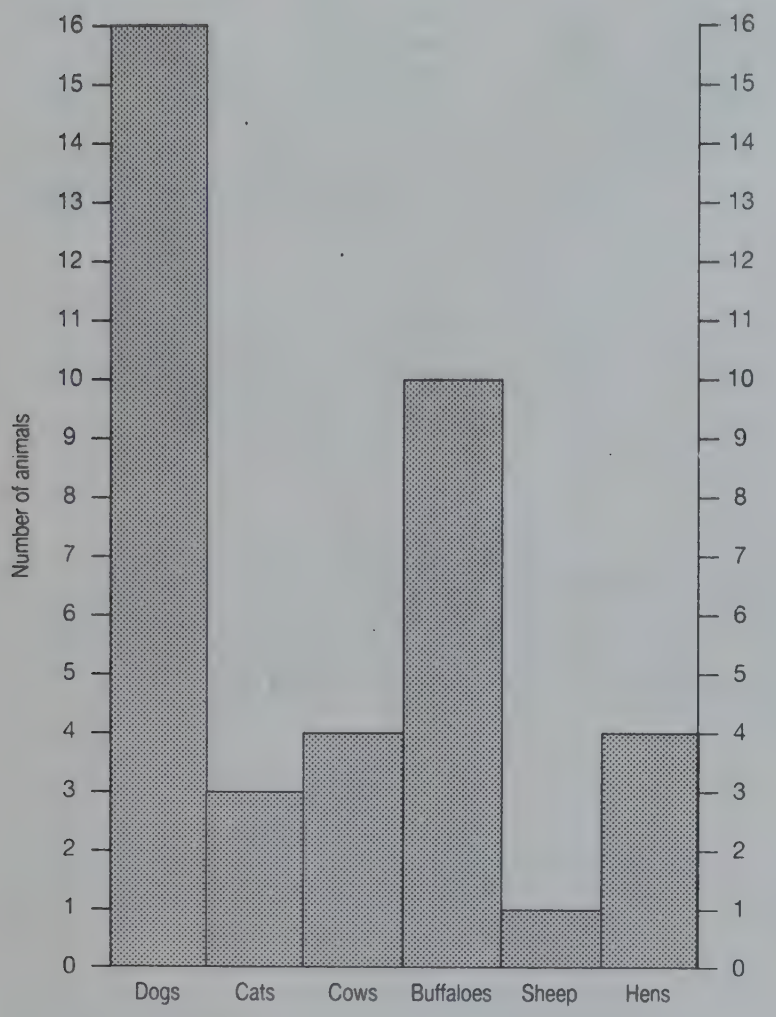
Ask the following questions :

1. What does your animal eat ?
   .....
2. How much food does it eat in one day ?
   .....
3. Where does it drink water ?
   .....
4. Where does it sleep ?
   .....
5. How do you keep it clean ?
   .....
6. What vaccinations has your animal had ?
   .....
7. What diseases has your animal had ?
   .....
8. What treatment did you give for each disease ?
   .....

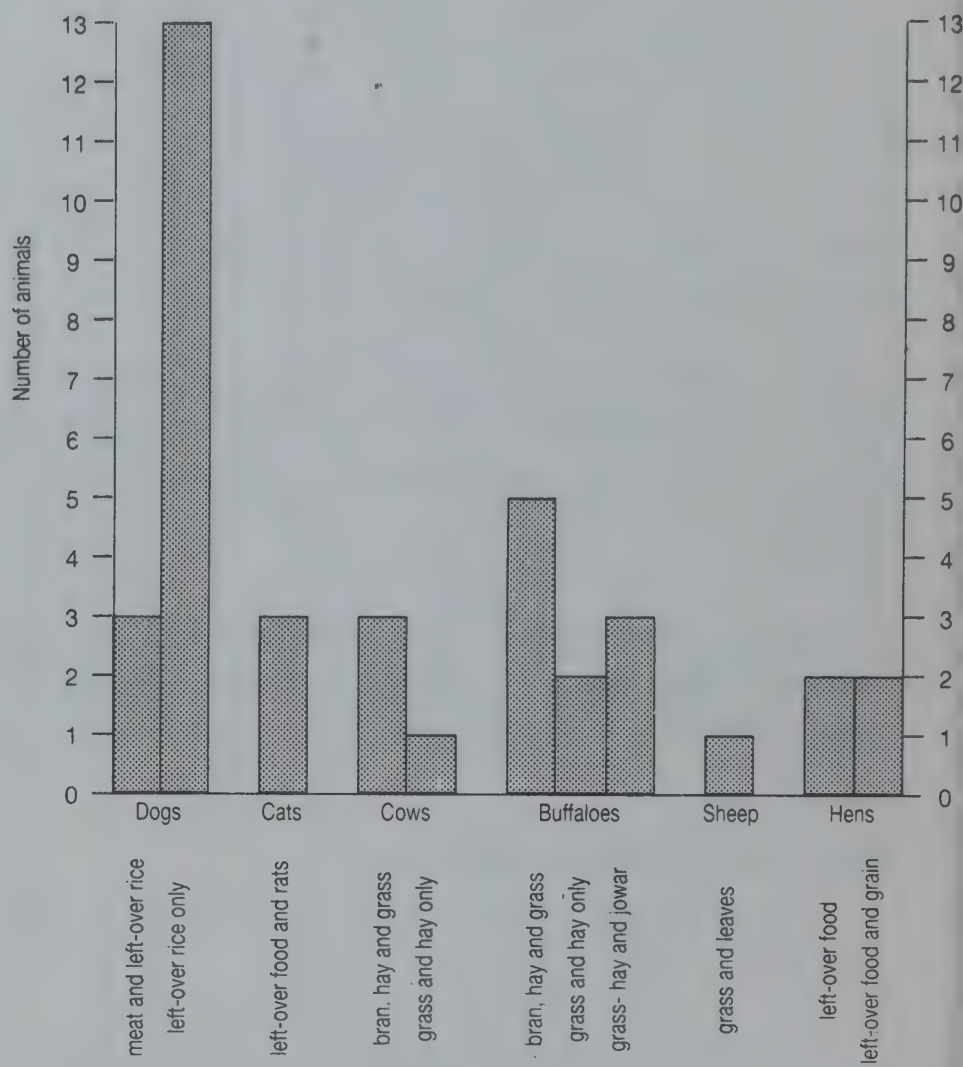
I. Looking at graphs of a survey

Here are two block graphs made by students of Class 4 in one school after a survey.

Number of animals in the survey



Food eaten by the animals in the survey



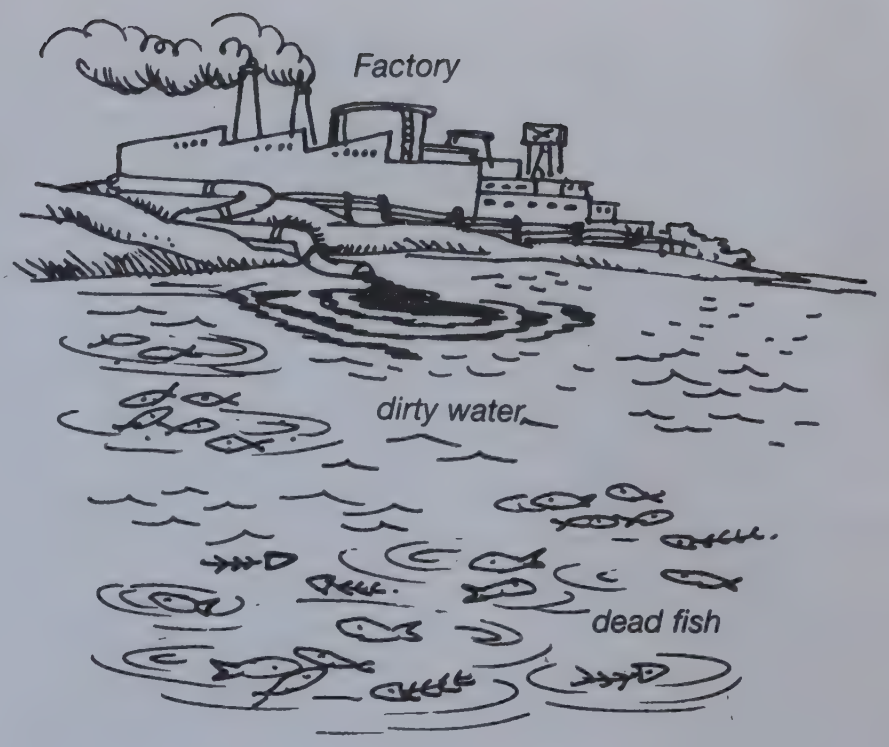
Write <u>True, False,</u> or <u>Cannot tell from the graph,</u> for the following statements.

1. The students of Class 4 questioned 37 people with animals. ( )
2. They questioned 5 people with hens. ( )
3. They questioned 14 people with cattle. ( )
4. Most people fed their dogs twice a day. ( )
5. Most people gave meat to their dogs. ( )
6. Only one person kept sheep. ( )
7. Eight animals altogether were fed on bran, hay and grass. ( )
8. All the buffaloes slept in a shed. ( )
9. All the dogs, cats and hens ate left-over food. ( )

J. Conserving wild animals

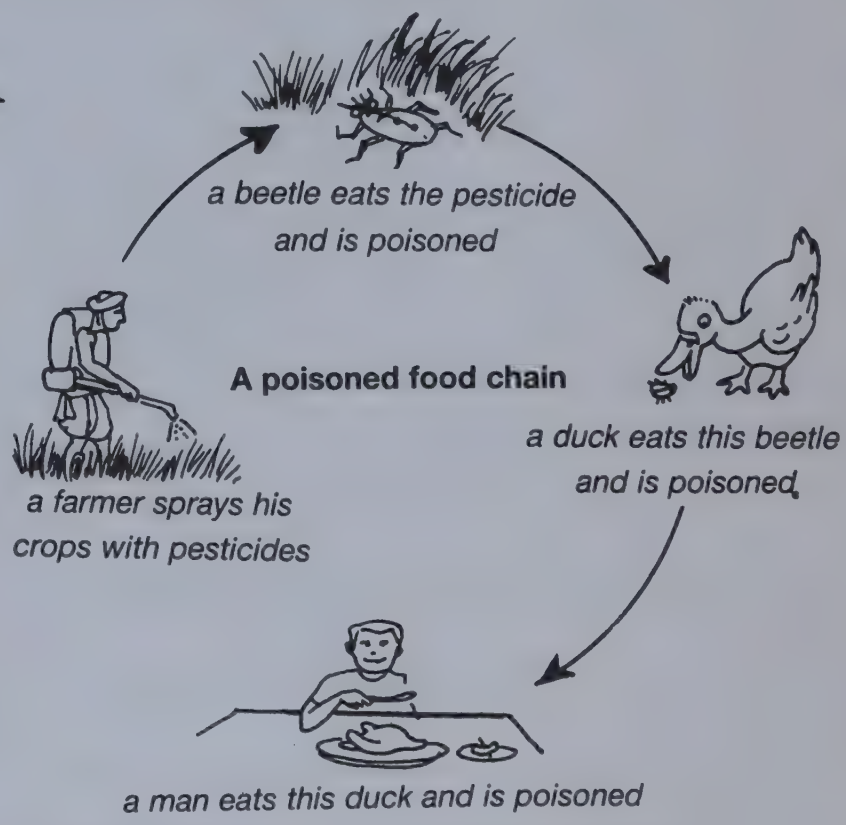
We should look after domestic animals well. We should also take care of wild animals. Nowadays, many wild animals are dying because of people. These animals have to be protected and looked after.

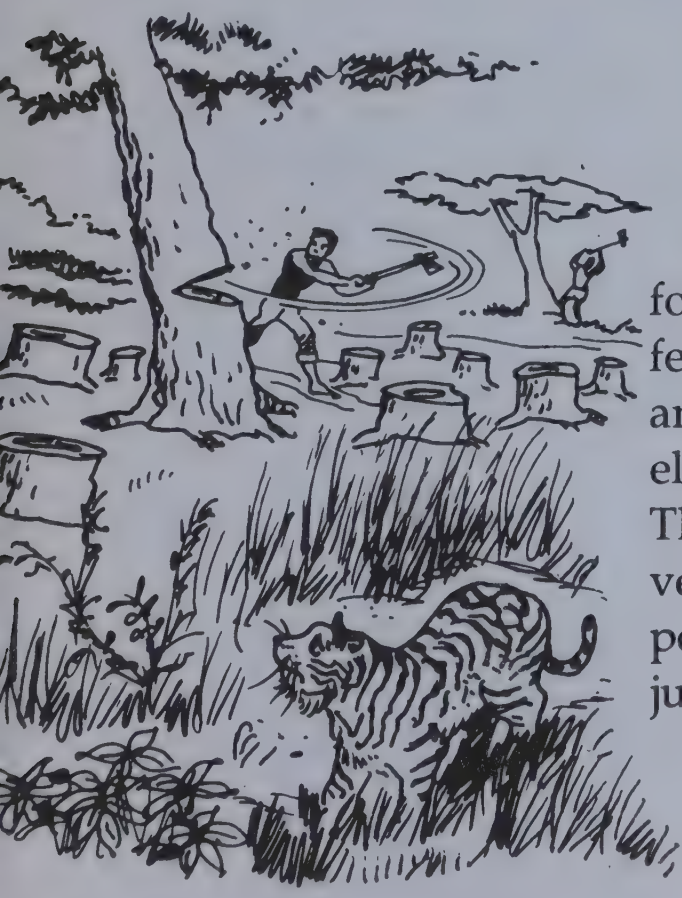
Factories often pollute rivers when they let out dirty water. Fish and water animals die because of the polluted water.



Sometimes ships carrying oil have accidents. The oil pollutes the sea and many fish, sea animals and birds die.

Farmers spray their fields with pesticides. The pesticides kill many insects—good and bad. Other animals and birds eat the insects. The poison goes into them. Sometimes we eat those creatures. Then the poison goes into us too. This is called a *poisoned food chain*.


a beetle eats the pesticide and is poisoned
a duck eats this beetle and is poisoned
a farmer sprays his crops with pesticides
A poisoned food chain
a man eats this duck and is poisoned



Every year more people are born. People cut down forests to make fields so that they can grow more crops to feed their children. But then there is nowhere for the wild animals to live. Some people kill tigers for their skin, elephants for their tusks and rhinoceroses for their horns. The tiger is the national animal of India. But there are very few tigers, elephants or rhinos in India today. The peacock is the national bird. But there are not many jungles where the peacocks can live.

Now there are laws to *protect* or *conserve* wild animals. Factories are not allowed to pollute rivers. People must not use too much pesticide. There are special national parks for wild life. Here, people are not allowed to kill wild animals. We should all obey these laws. This map shows some important national parks :

Complete the following sentences :

1. River fish often die because ..... pollute the water.
2. Sea fish and birds sometimes die when ..... comes out of ships.
3. When one animal is poisoned and another animal eats it, we say that the .....is poisoned.
4. Some wild animals are dying because people are cutting down the .....to make fields.
5. People sometimes kill wild animals for their meat, ...or ..... .
6. Now there are laws to ..... animals.
7. People are not allowed to kill wild animals in India's ..... .

Revision

I. Match these words to their meanings:

domestic	protect
carnivore	an animal which eats meat and vegetables
omnivore	looked after by people
dung	poisons used to kill harmful insects and animals
gobar gas	a disease you can get from mosquito bites
rabies	an animal which eats meat
pesticides	gas made from dung
malaria	an injection to stop an animal from getting a disease
vaccination	a disease you can get from the bite of a dog
conserve	animal waste matter

II. Take a large sheet of white paper. Design a poster to teach people the uses, the dangers or the care of animals. Decide on one topic, for example "How to kill headlice" or "How factories can pollute water". The poster should have a simple message and a clear, colourful picture. Put the best posters on the walls of your school.

III. Answer these questions:

1. What is the difference between a domestic and a wild animal?
2. Write two uses of each of these animals : chickens, goats, cows.
3. Draw a simple picture of a gobar gas plant.
4. Name three ways in which animals can harm us.
5. Which insects give us a kind of cloth ?
6. Name three insects which eat wood or paper.
7. Name three insects which suck blood.
8. Describe how to look after domestic animals.
9. How do some factories harm wild animals?

IV. Draw graphs of your own after making a survey like the one on page 13 and 14. Collect all necessary information by asking questions. Put the answers together and make graphs. Put these graphs on the display boards of your school.

V. Extension work

Imagine that you are a tiger in the jungle. People are cutting down the trees. There are fewer and fewer animals to hunt. Yor are hungry, but you have nowhere to go. What will you do? Write the tiger's story.

UNIT 2

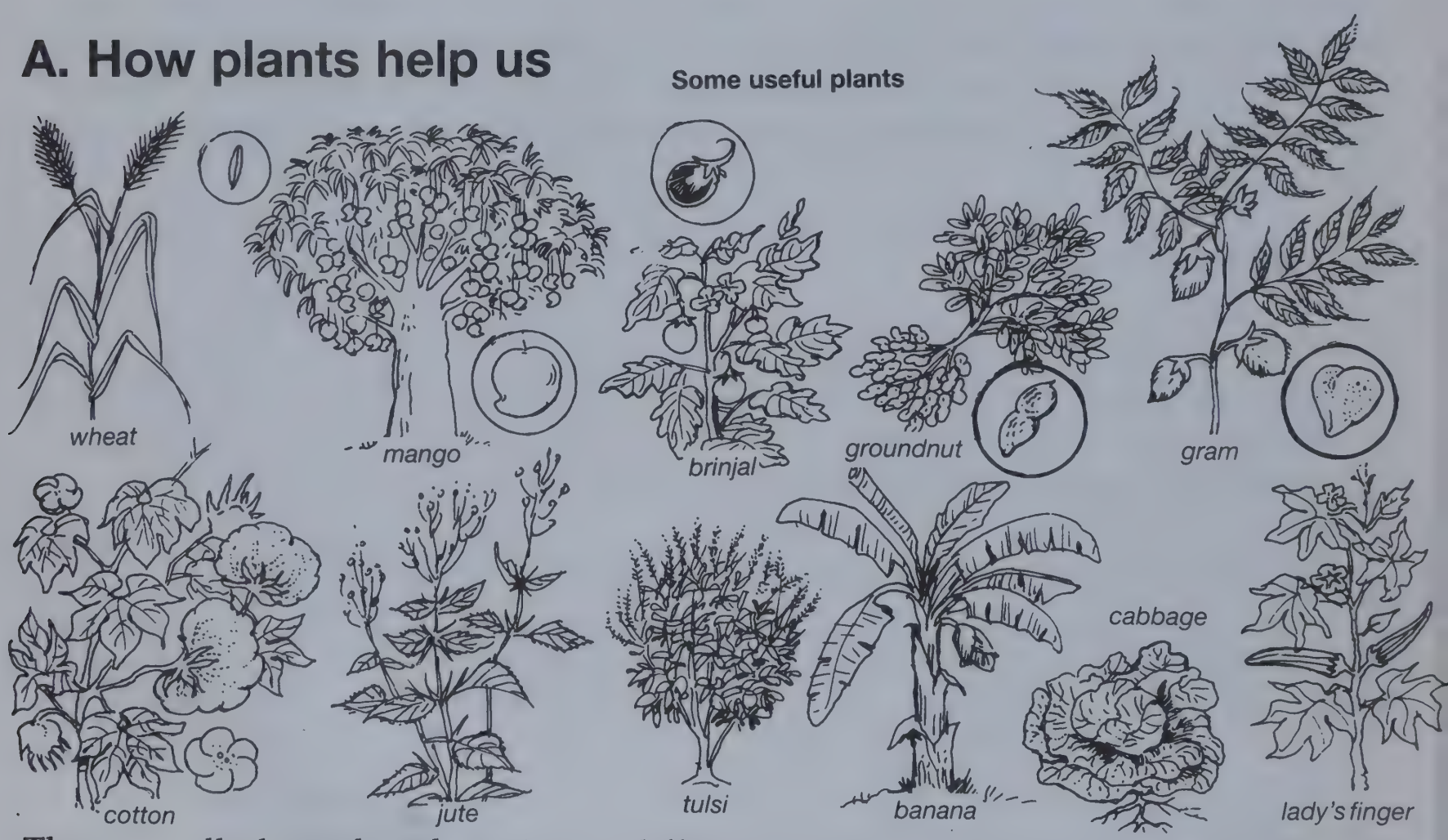
Plants in our Lives

Key words

accurate : exact e.g. *An accurate measurement is exactly right.*
carbon dioxide : a gas in the air e.g. *Plants need carbon dioxide to live.*
chlorophyll : a green substance in plants which helps them to make their food
decaying : growing old and rotten
fair test : an experiment which tests different things under the same conditions
manure : animals' dung which is used to make the soil good for growing crops
oxygen : a gas in the air e.g. *People and animals need oxygen to live.*
water vapour : water which has evaporated or turned into a gas

A. How plants help us

Some useful plants



These are all plants, but they give us different things. Some give us fruit, nuts and vegetables. Some give us cereal crops like rice, jawar and maize. Some give us pulses or dals. Some give oil, like sunflower seeds. Other plants do not give us food, but they are still useful. Many medicines like mint and neem come from plants.

Plants like jute and cotton also give us different kinds of thread which can be woven into cloth or gunny sacking. Wood from trees is used for building, furniture and paper making. The rubber on the bottom of shoes and in bicycle tyres comes from the juice of a rubber tree.

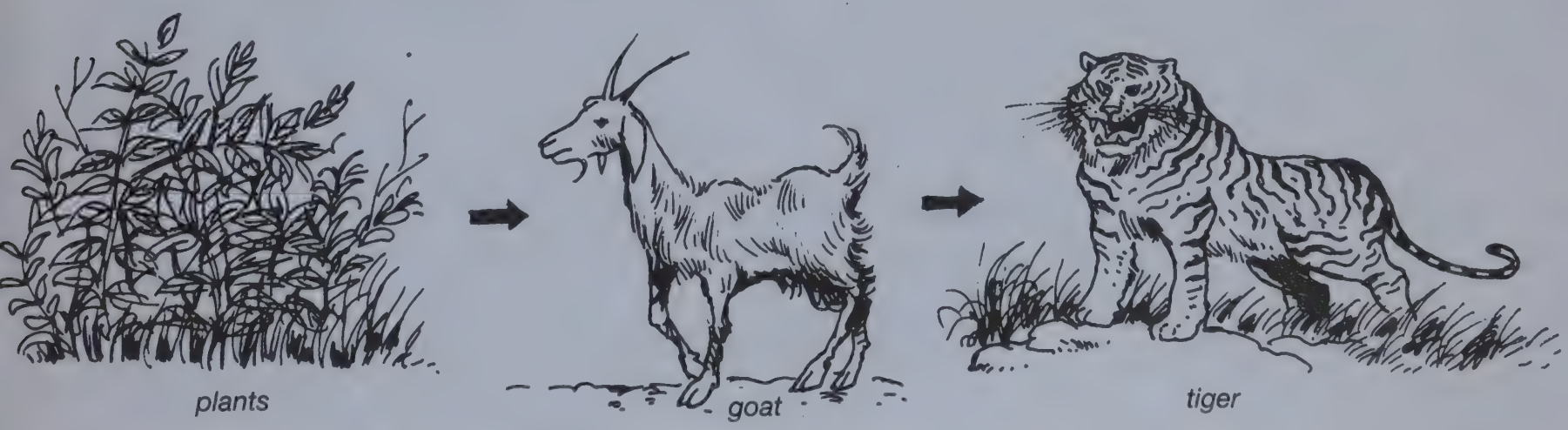
Put each of the pictured plants into one of these boxes. You may need to put one plant into two boxes. Two are done for you.

give fruit	give nuts	give vegetables	give cereal crops
			rice
give pulses	**give oil**	**give medicines**	**give cloth**
gram			

B. Why we need plants

We cannot live without plants. Plants give out oxygen. Oxygen is one of the gases in air. Without oxygen, all animals and plants would die. Animals breathe out carbon dioxide which is another gas in air. Too much carbon dioxide is bad for us. Plants help to turn carbon dioxide into oxygen.

There is another reason why we need plants. Plants can make their own food, but animals cannot do this. So all animals need plants in one way or the other. Even if they eat other animals, those animals eat plants.

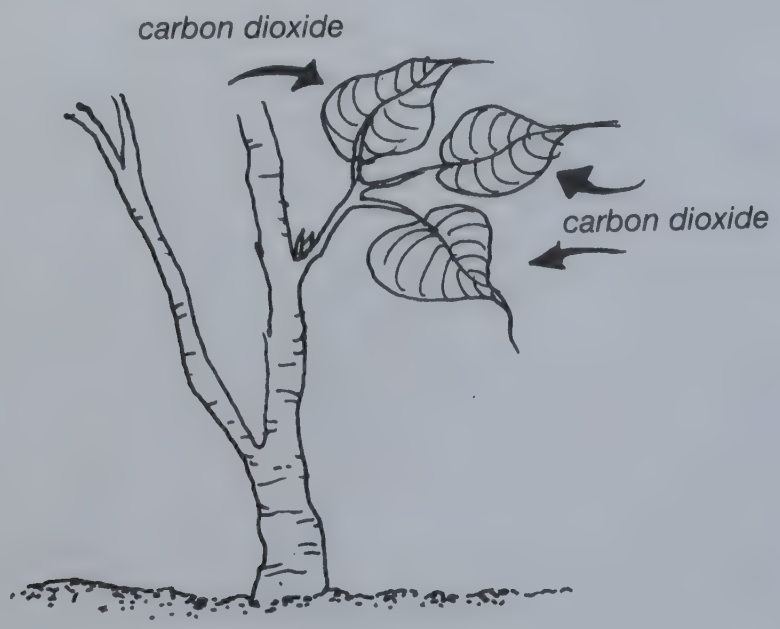


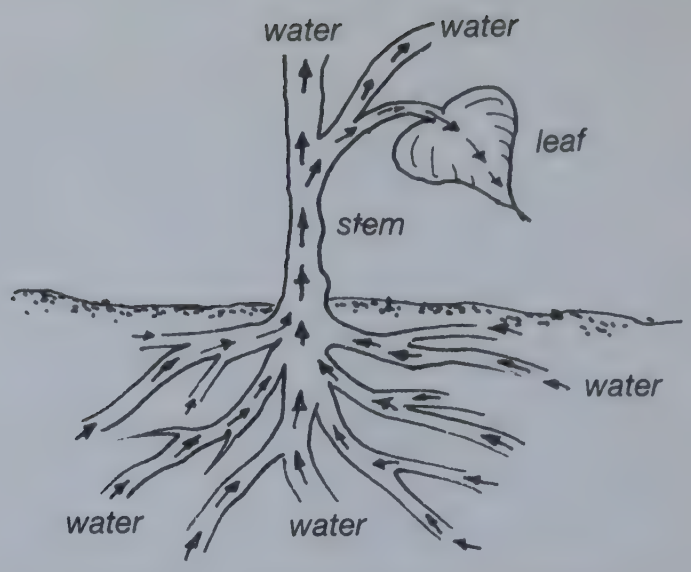
The grass feeds the goat. The goat feeds the tiger. So the tiger needs grass.

THIS IS HOW PLANTS MAKE THEIR OWN FOOD

1. The roots of a plant take in water from the soil.

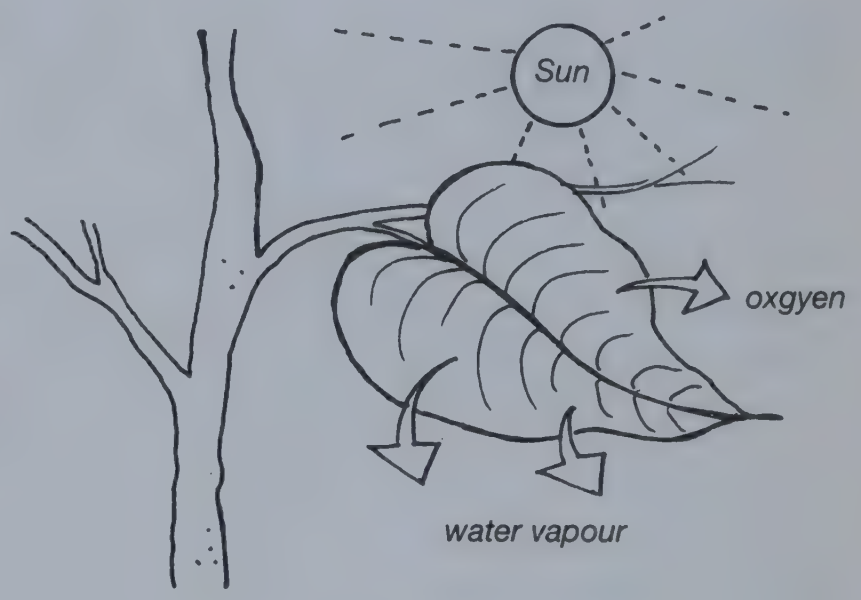
2. The stem takes the water to the leaves.





3. The leaves of a plant take in carbon dioxide from the air.

4. *Chlorophyll*,which gives the green colouring to plants, takes in sunlight. Plants use sunlight, carbon dioxide and water to make food. Then they give out water vapour and oxygen. This is called *photosynthesis*.



Put these sentences into the right order.

* It goes up the stem to the leaves.
* When the sun shines, chlorophyll in the leaves turns the water and carbon dioxide into food.
* Water goes into the roots of a plant.
* The plant gives out oxygen and water vapour.
* People and animals breathe in the oxygen.
* Carbon dioxide goes from the air into the leaves of the plant.

START LIKE THIS:

1. Water goes into the roots of a plant.

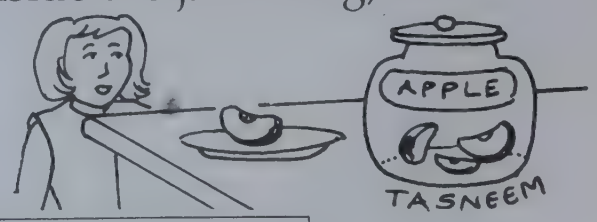
C. How decaying plants help us

Like us, plants grow old and die. But they are still useful after they are dead. They go brown and rot. These rotten and decayed plants mix with the soil. They make the soil fertile. So old, dead plants make food for new plants.

Dead plants have also given us coal and oil. Millions of years ago, forests fell to the ground. The rotten plants were squashed down and turned into coal and oil.

Over the next few weeks you are going to do an experiment with decaying plants. When you come to school tomorrow, bring two small pieces of vegetable or fresh fruit. Or you may bring in two pieces of roti or bread or two teaspoons of cooked rice. Bring the food in a clear plastic bag or a glass jar. Stick a label on your jar or bag. Write what is inside and also write your name on the label. When you get to class, take out <u>one</u> piece of what you have brought from home. Then put the lid tightly on the jar or tie up the plastic bag. No air should get inside. Put the second piece of food on a small plate and leave both pieces of food undisturbed.

Take a new double page of your exercise book. Every day, record how your food changes. Use a ruler to make two columns—one for the food inside the jar or bag, one for the food on the plate. Keep your record for three weeks.



Tasneem brought in two pieces of apple on 22 February. This is the beginning of her record:

A record of the changes to my pieces of apple

Date	*In the jar with a tightly closed lid*	*On the plate*
23 Feb.	*It went a bit brown.*	*It went brown.*
24 Feb.	*It was a darker brown.*	*The peel is wrinkled.*
25 Feb.	*Weekend : No record*	
26 Feb.	*There is a small white patch on the skin. The inside looks mushy.*	*The peel is curling up. It looks dry.*
27 Feb.	*The white patch is bigger.*	*It seems smaller.*

After you have recorded your experiment for three weeks, discuss your findings in class.

1. Which foods decayed faster:
   a) food inside the plastic bag or jar, or the food kept on the small plate?
   b) the wet food or the dry food?
   c) fruits, vegetables or cereals?
2. Did any food not decay at all? Why not?
3. Which foods dried up? Why?

D. How to look after plants

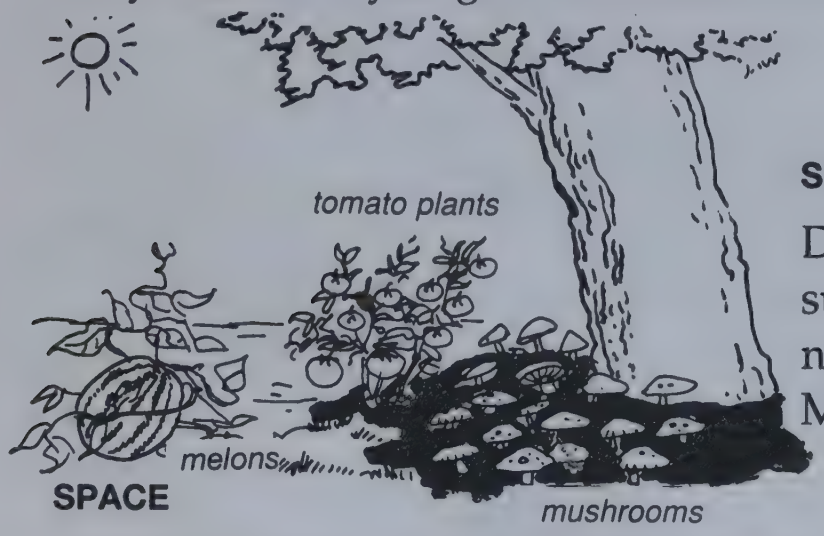
We have learned that all plants need soil, water and sunlight to live. In this lesson, we are going to learn more about how to help plants grow well.

SOIL

Different plants need different kinds of soil. Cotton, for example, grows well in black soil. Groundnuts need red soil. Melons need sandy soil. Rice needs clayey soil.

WATER

Different plants need different amounts of water. Rice needs a lot of water. Ragi needs less water than rice. Cactuses need less water than ragi. They will die if you give them too much water.

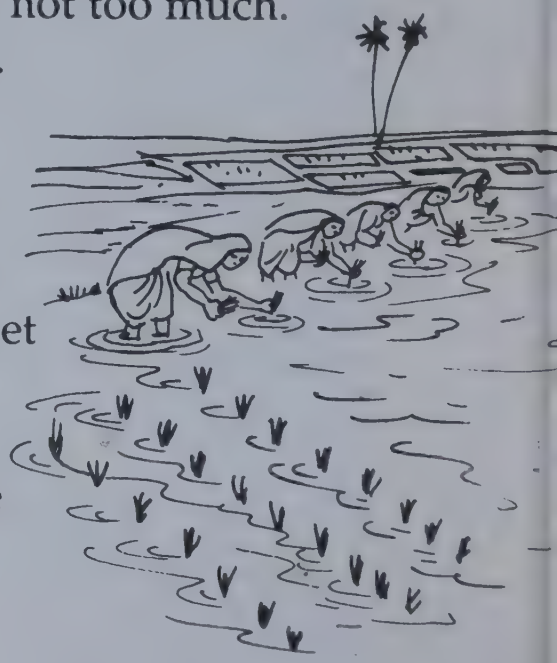


SUNLIGHT

Different plants need different amounts of sunlight. Melons need a lot of sunlight. Tomatoes need some sunlight, but not too much. Mushrooms need shade.

SPACE

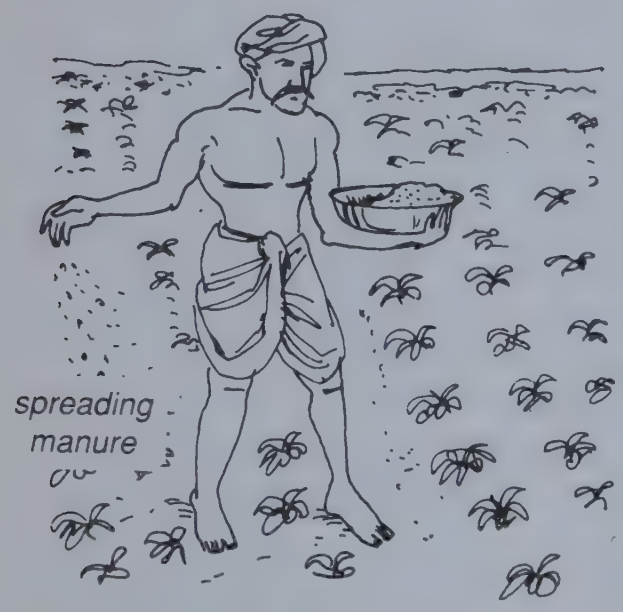
Different plants need different amounts of space. We usually plant seeds some way apart from each other so that they have space to grow. Sometimes we uproot baby plants when they get too big and plant them again so that they have more space around them. Paddy fields are bright green when the rice plants are young and close together. Then we must uproot the small plants and plant them again—this time further apart.



WEEDS

Different plants need to be weeded in different ways. Sometimes we must pull out weeds near a plant because they take away its water and sunlight. Sometimes weeds make the soil good and stop harmful insects from getting at our crops, so we should leave them in the soil.

weeding



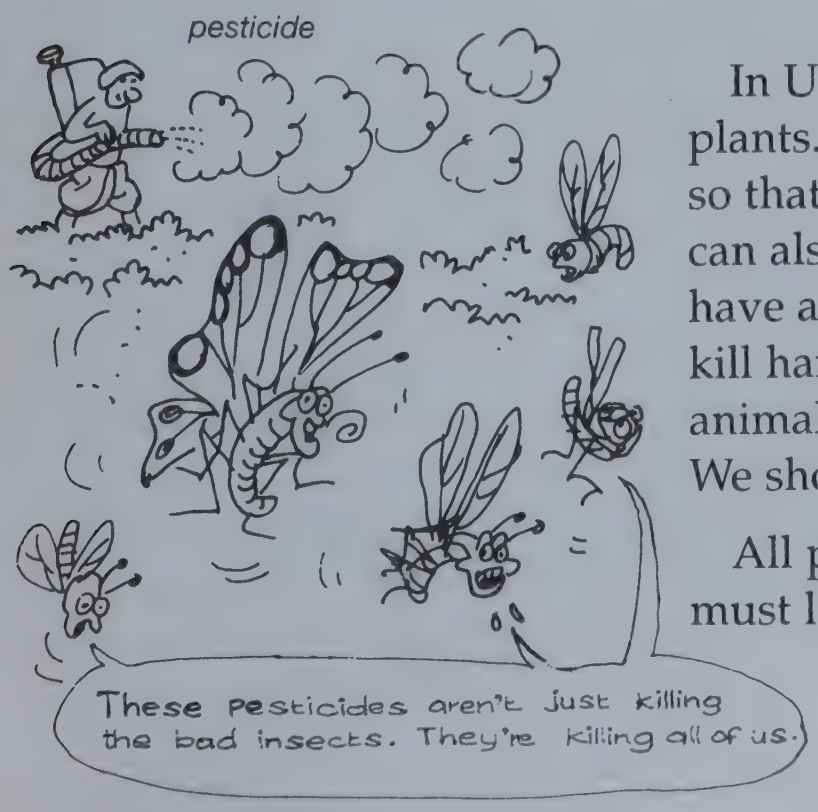
spreading manure

FERTILISER

Different plants need different kinds of fertiliser. Most plants need manure or animal dung. These are the best fertilisers because they are natural. We can also put different chemical fertilisers on different kinds of soil. Two common chemical fertilisers are *urea* and *nitrates*. These fertilisers can help us to grow more crops for a few years. But we must be careful with them. They can poison the water in the soil. They can also take away the natural goodness of the soil.

INSECTS AND ANIMALS

We must protect plants against different kinds of insects and animals. Insects and animals often eat plants and kill them. For example, goats can eat young trees so that the trees never grow again and insects like locusts can destroy whole fields of crops. We have to keep cows, sheep, buffaloes and insects out of our fields so that they don't eat our crops.



In Unit 1, we learned about insects which eat up plants. We can grow different plants near each other so that they protect each other against bad insects. We can also use natural pesticides like neem cake. We have already learned about chemical pesticides. These kill harmful insects, but they kill other insects and animals too. They also poison the soil and the crops. We should be very careful with chemical pesticides.

All plants are different and have different needs. We must learn what each plant needs before we grow it.

THE GREAT PLANT CARE QUIZ !

Don't look back. See how much you can remember! Choose the best answer and write a, b, c or d in the brackets provided.

1. Groundnuts grow well in
   a) red soil.
   b) black soil.
   c) sandy soil.
   d) clayey soil. ( )

2. Rice needs
   a) a lot of water and clayey soil.
   b) a lot of water and sandy soil.
   c) only a little water and sandy soil.
   d) only a little water and clayey soil. ( )

3. Tomatoes need
   a) bright sunlight all through the day.
   b) some sunlight, some shade.
   c) shade all day.
   d) no water at all. ( )

4. We should pull out weeds because
   a) they can kill the crops.
   b) they take away water from the crops.
   c) they take away water and sunlight from the crops.
   d) they bring bad insects that eat the crops. ( )

5. The best fertiliser is
   a) animal dung.
   b) urea.
   c) nitrate.
   d) shade. ( )

6. Goats can be harmful to plants because
   a) they drop dung.
   b) they are animals.
   c) they eat the leaves of trees.
   d) they poison the soil. ( )

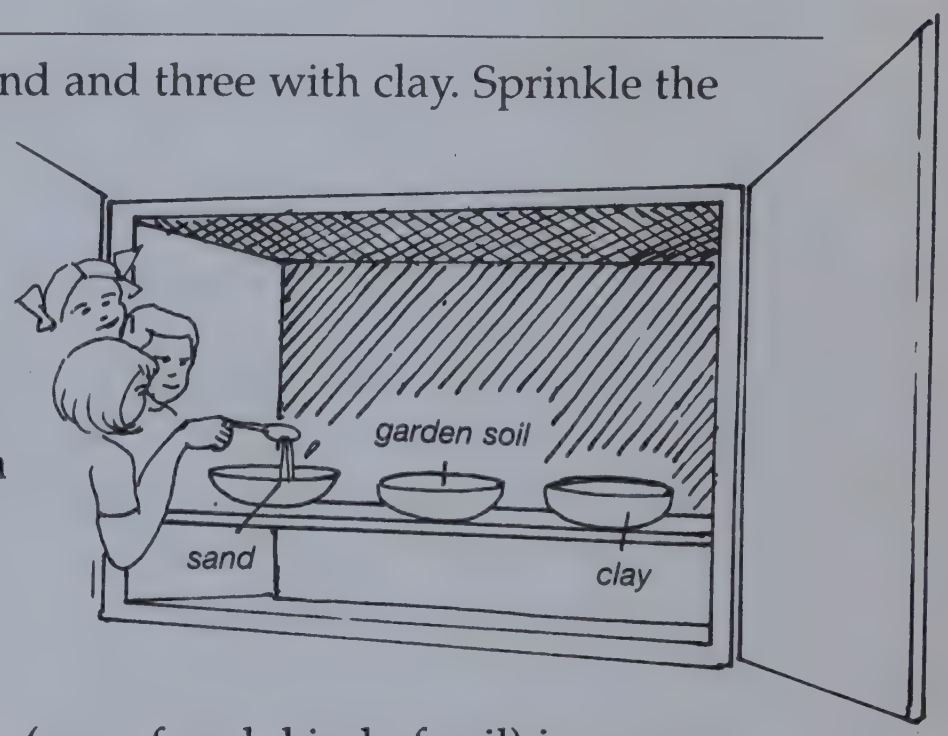
7. Chemical pesticides can be dangerous because
   a) they give us malaria.
   b) they can poison the crops and many kinds of animals.
   c) they are very expensive in the market.
   d) they do not kill insects. ( )

E. An experiment: Growing plants under different conditions

You will need:

- some fast-growing seeds, e.g. mustard seeds,
- nine deep plates,
- some good garden soil,
- some sand,
- some clay.

Fill three plates with garden soil, three with sand and three with clay. Sprinkle the same number of seeds on each of the nine plates.

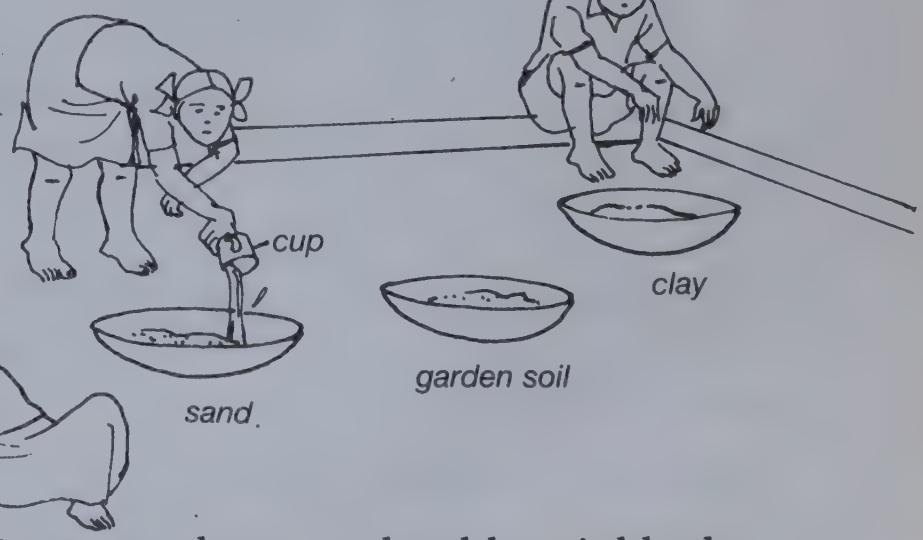


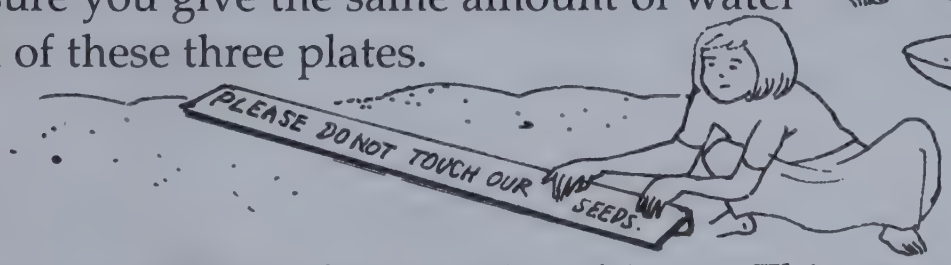
You are going to look after these seeds for two weeks.

Put three plates – one of sand, one of garden soil, one of clay – in a cupboard. Sprinkle them every day with a little water. Use a spoon to measure out the same amount of water for each plant. Make sure that you keep the soil damp, but not wet.

Put three plates (one of each kind of soil) in a sunny place—perhaps a sunny window sill in your classroom. You could also find a quiet place in the playground and write a notice to tell other children not to touch them. Sprinkle them every day with a little water—the same amount you give the plants in the cupboard.

Put three plates (one of each kind of soil) in a sunny place. Pour a cupful of water into each plate every day, but do not let it overflow. Make sure you give the same amount of water to each of these three plates.





It is very important that you do a *fair test*. This means that you should sprinkle the same amount of water on each of the first six plates each day. Measure it with one large spoon. You should fill the cup with the same amount of water for each of the last three plates. You should see that all the plates in the sunlight get the same amount of sunlight. Then your results will be accurate.

Copy this table into your exercise book. Guess what will happen to each plate of seeds. It doesn't matter if your guess is wrong. Have a try! You can use the words in the box for each one — or make up your own guesses if you wish.

- ⋆ will grow a little, then die;
- ⋆ will grow quite high;
- ⋆ will grow very high;
- ⋆ will not grow at all;

My guesses: *I think the seeds:*

in sand in the cupboard .....
in clay in the cupboard.....
in garden soil in the cupboard .....
in sand in the sun with a little water.....
in clay in the sun with a little water.....
in garden soil in the sun with a little water.....
in sand in the sun with a lot of water .....
in clay in the sun with a lot of water.....
in garden soil in the sun with a lot of water.....

F. Making a line graph

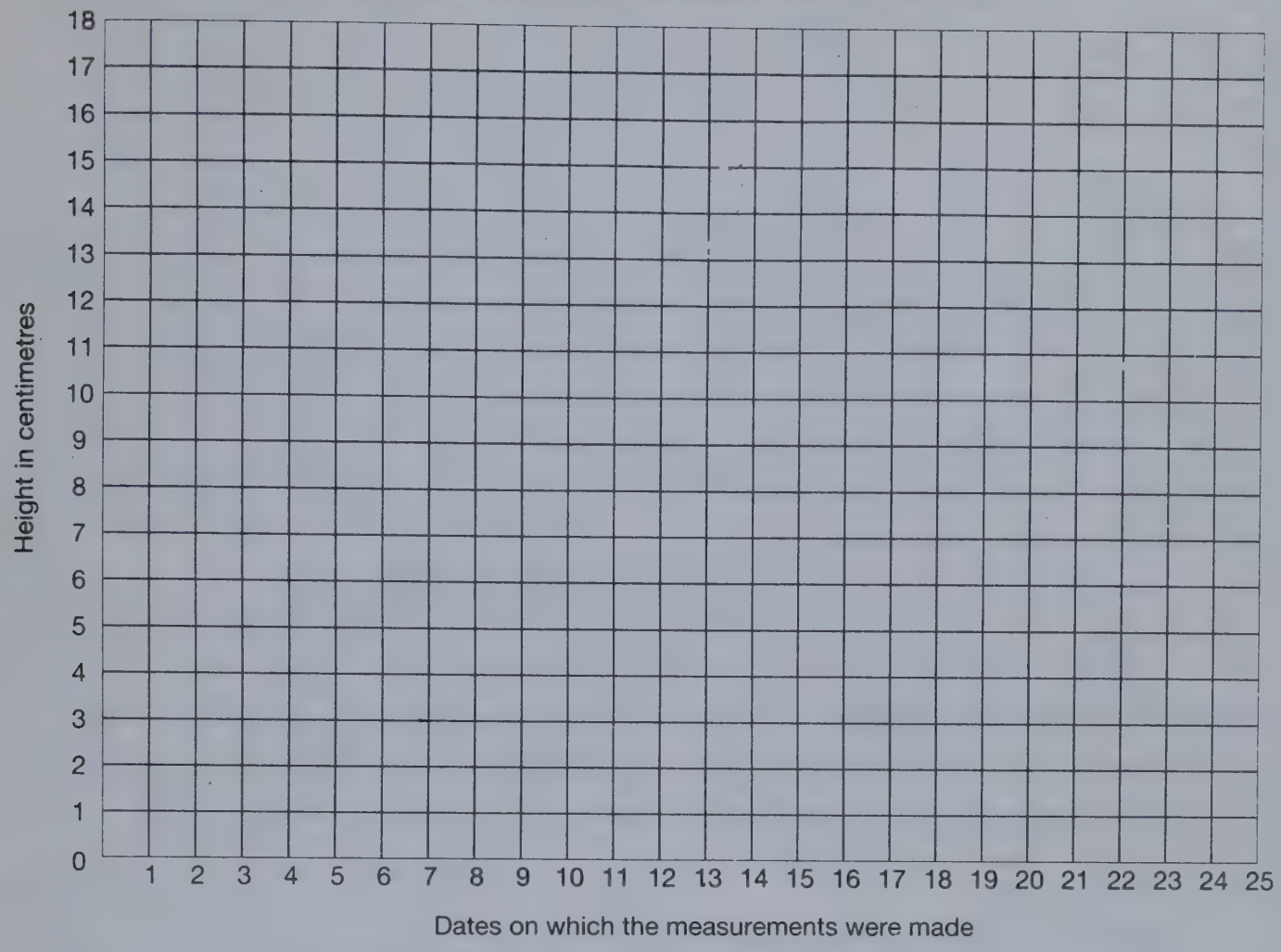
You will need:
- ⋆ 3 pieces of squared paper (or rule squares accurately into your book),
- ⋆ a ruler, 3 coloured pencils, one red, one blue, one green.

In Unit 1, you made a block graph about animal care. Block graphs show facts at one time. Now you are going to make some line graphs. Line graphs show how things change over time.

Copy the graph outline given on the next page onto three pieces of squared paper. Do one for the seeds in the cupboard, one for the seeds in the sun with a little water, one for the seeds in the sun with a lot of water.

Measure your seedlings every day. Put a point on the correct line of your graph. Join this point to the point you made yesterday. Record the growth of the seedlings in sand with a red line. Use a blue line for the seedlings in clay and a green line for the seedlings in garden soil. So you should have three lines on each graph. If you miss out a day or two (e.g. at weekends), leave a square for each of the dates you did not measure. Join today's point to the one you made last.

A graph to show the growth of seedlings (in the cupboard with sprinkling of water)



Key

red : sand
blue : clay
green : earth

When you have finished your graphs after two weeks, look at the guesses you made in exercise E. Then look at your three graphs.

1. How many of your guesses were right? Which results surprised you?
2. Which seedling grew best? Which did not grow well?
3. Did some seedlings grow fast and then die? If so, why?
4. Which was best — clay, sand, or earth? Why?

G. How plants spread their seeds

In exercise D, we learned how to look after plants. We give them water and manure. We make sure that every plant has space. When people plant seeds, they usually leave gaps between each one. Then they have space to grow.

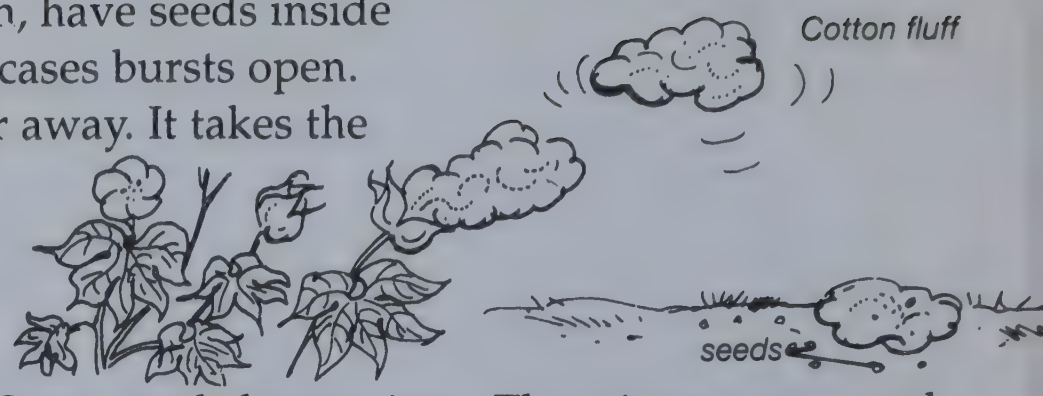
But if we stop planting seeds, will plants stop growing? Do plants need us?

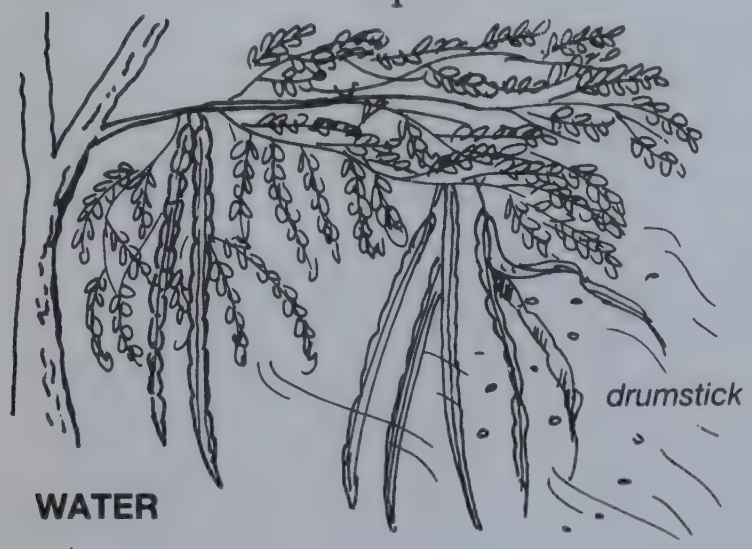
Not really! We choose to plant seeds which will be useful to us. We look after them and pull out the plants we don't want. But plants can live without us! They know how to give themselves space.

Each plant has its own way of spreading seeds, so that each seed has space to grow. The seeds are carried to different places in different ways.

WIND

Some plants, like cotton and silk-cotton, have seeds inside fluff. When the seed is ready, the seed cases bursts open. Then the wind carries the light fluff far away. It takes the seeds all over the place.

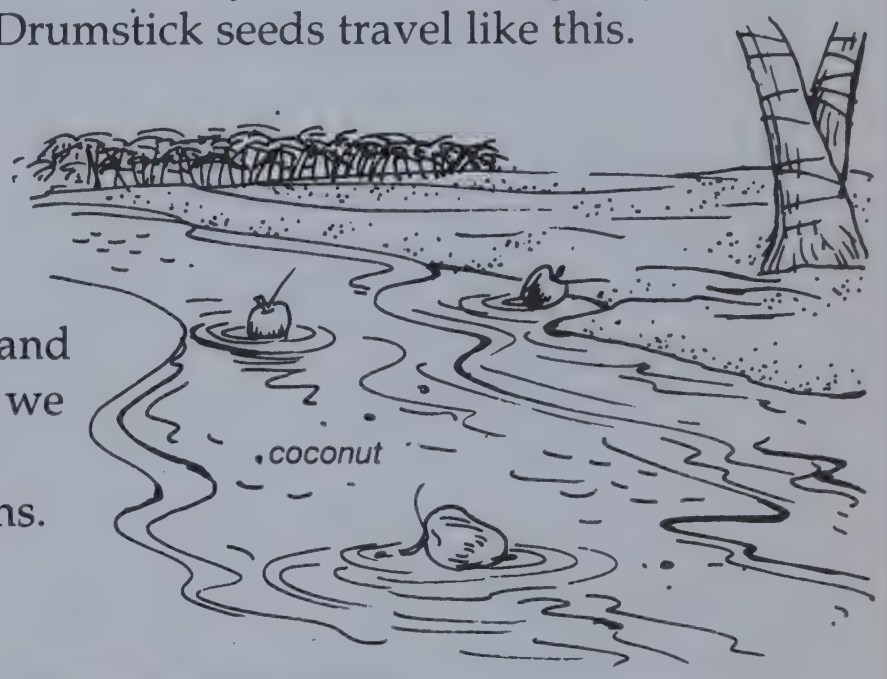




Some seeds have wings. The wings turn round in the wind and carry the seed a long way from the tree. Drumstick seeds travel like this.

WATER

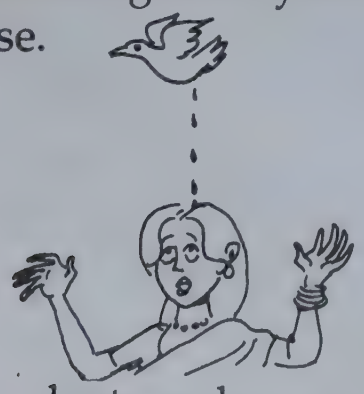
Some seeds travel long distances by water. Coconut palms drop coconuts into the water and they can float hundreds of miles. This is why we often see coconut trees by the sea. Lotus and water lily seeds travel along rivers and streams.



INSECTS, ANIMALS AND BIRDS

Some insects, animals and birds like to eat fruit, but the seed is not so tasty. So they pick the fruit, eat it and throw the seed away — somewhere else. You have probably thrown away a lot of seeds yourselves.

Some seeds are sticky or have little hooks on them. They stick to animals which pass by. After a while, the animals get itchy and scratch them off — somewhere else.



Sometimes birds and animals eat the seeds along with the fruit. The seeds come out later in their dung — somewhere else.

So plants make sure that their seeds spread around without our help. Don't forget — we cannot live without plants, but they can live quite well without us!

Draw and label these pictures:

1. a seed with wings
2. a seed which floats on water
3. a seed thrown after the fruit is eaten
4. a seed blowing in fluff
5. a seed which sticks to an animal's fur
6. Go outside. Find at least two seeds. Find out what plant they come from. Look at them carefully. Draw and label them.

H. Conserving trees

Plants can live without us, but we are destroying many plants by the way we live. We need wood for buildings, furniture and paper, so we cut down trees. We are cutting down so many trees that they never grow big enough to make seeds. We are cutting down the forests faster than they can grow.

It is wrong to cut down forests because forests help us in many ways.

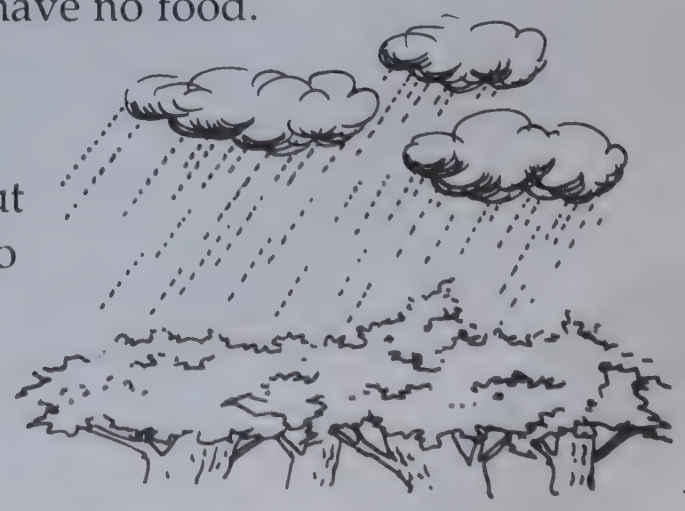
1. *The roots of trees hold the soil down.* Look at the boy in the picture. He is holding his papers down so that the wind does not blow them away. The tree is holding down the soil in the same way.

The roots of this tree stop the soil from blowing away.

There are no trees to hold down the soil so it blows away in the wind – like this pieces of paper.

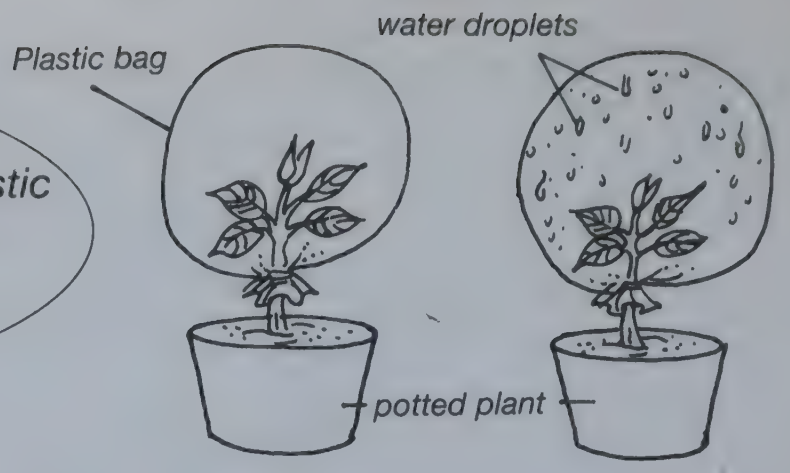
If there are no trees, the wind blows away the soil and the rain washes it away. Soil is only a few feet deep. Under the soil is rock. If all the soil blows away or runs away in the rain, there will be no soil left. When rain falls, it will not soak into the soil to fill our wells and pumps. It will run away to the sea. Then we will not be able to grow crops. Our good land will turn into a desert. We will have no food.

2. *Trees give us oxygen and water vapour.* We have already learned that trees give us oxygen. We cannot live without oxygen. Trees also give out water vapour which helps to cool down the air and to bring rains.



Did you know ?

If you leave a potted plant covered with a plastic bag overnight, you can find droplets of water in the plastic bag the next day.



3. *Trees give us shade and many useful things.* In most towns and villages, people like to sit or talk under a tree. It is nice to talk in the cool shade of a tree. Trees make our lives pleasant. Of course they also give us fruit, sticks for our brooms, fibre for our baskets, as well as wood.

SO WHAT CAN WE DO?

1. *Plant trees :* Every time we cut down a tree, we should plant two. Every year we have a Vanamahotsava or forest week. Try to plant two trees every year—at school, at home or by the road.
2. *Look after trees :* It is not enough to plant trees. We must look after them afterwards. We should water most trees every day for two or three years before they can grow on their own. If there are young trees near your home, water them, even if they are not in your compound.
3. *Use dead branches for firewood* : Don't cut trees for firewood. Collect dead branches which fall naturally. Try to use different kinds of fuel like gobar gas.
4. *Don't make fires in forests* : A small fire can spread and burn hundreds of trees. Be careful not to start a fire.

Write four sentences about conserving trees in each column.

Do	Don't

Revision

I. Write down at least six different ways we use plants.

II. Draw and label a diagram to show how photosynthesis works in a plant.

III. Complete the sentences below with words from the box:

space	animals	roots	decaying	wind	manure
fair	insects	water	sand	clay	

1. Lotus seeds are spread by ..... .
2. Cotton seeds are spread by ..... .
3. When plants are dead and rotting, we say that they are ..... .
4. ..... is the best fertiliser for crops.
5. Rice plants must be planted twice because as they grow they need more ....
6. We must protect crops from ..... and ..... .
7. ..... is not usually good for growing plants because water drains away too slowly.
8. ..... is not usually good for growing plants because water drains away too fast.
9. When you do an experiment, it is important to do a ..... test.
10. We should not cut down all our trees because their ..... hold down the soil.

IV. Extension work

1. Describe in your own words what happened in your experiment with decay. Try to explain why some foods decayed in different ways.
2. Describe what happened when you tried to grow seeds in different conditions. Try to explain your results.

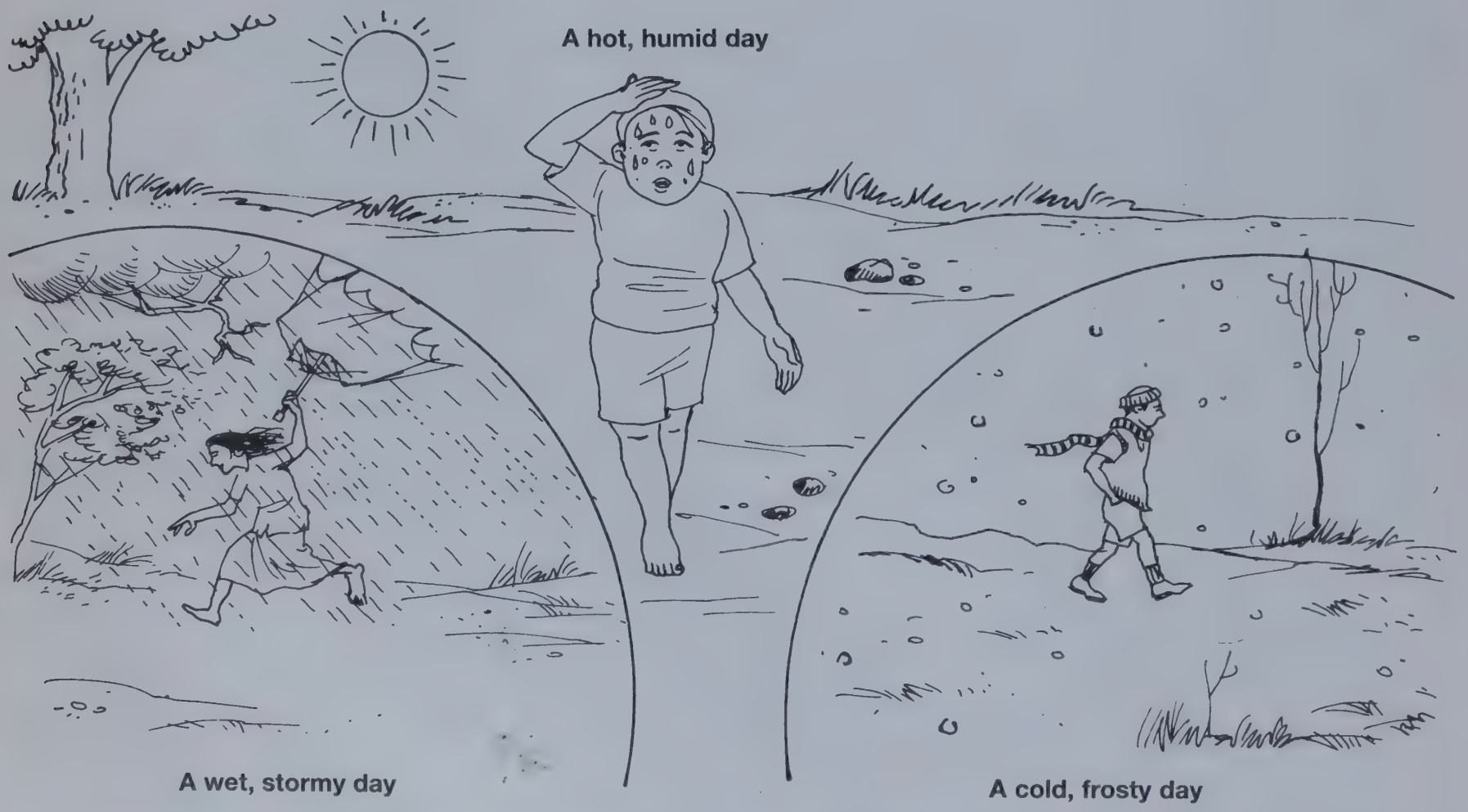
UNIT 3

The Weather

Key words

cirrocumulus : mixture of cirrus and cumulus clouds.
cirrus : light and feathery clouds
coastal : near the sea
convection : When hot air rises and cool air comes in to take its place, there is a *convection* current of air.
cumulonimbus : big grey cumulus clouds
cumulus : white and fluffy clouds
cyclone : a very, very strong wind which forms over the sea
dew : water which condenses on the ground at night
estimate : to guess
frost : frozen dew
gale : a strong wind
humid : moist e.g. *The air is humid when there is a lot of water vapour in it.*
temperature : the amount of heat or cold e.g. *The temperature today is 40 degrees centigrade.*
thermometer : an instrument that measures the temperature

A. The weather today



The weather makes a big difference to our lives. When it is humid, we sweat a lot and we need to have more baths. If it is hot and dry, we feel thirsty and we drink a lot of water. When there is a thunder storm, we have to keep dry and be careful of the lightning. When it is cold, we need to wear more clothes to keep ourselves warm.

Talk about the weather today. Then answer these questions in your notebooks. Look in <u>Key words</u> on page 32 to find the meanings of words you do not know.

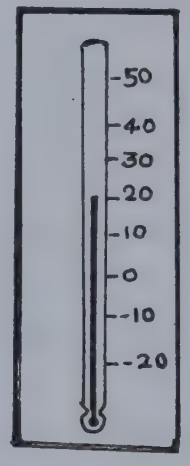
1. Is it sunny, cloudy or both sunny and cloudy today?
2. If it is cloudy, what kind of clouds are there—are they white and fluffy, big and black or grey all over the sky?
3. Is it windy enough to fly a kite?
4. Has it rained today?
5. Is it humid or dry?
6. Is it warm enough to set curds?
7. Is it cold enough to turn coconut oil hard?
8. Was there frost or dew on the ground in the morning?

B. Temperature

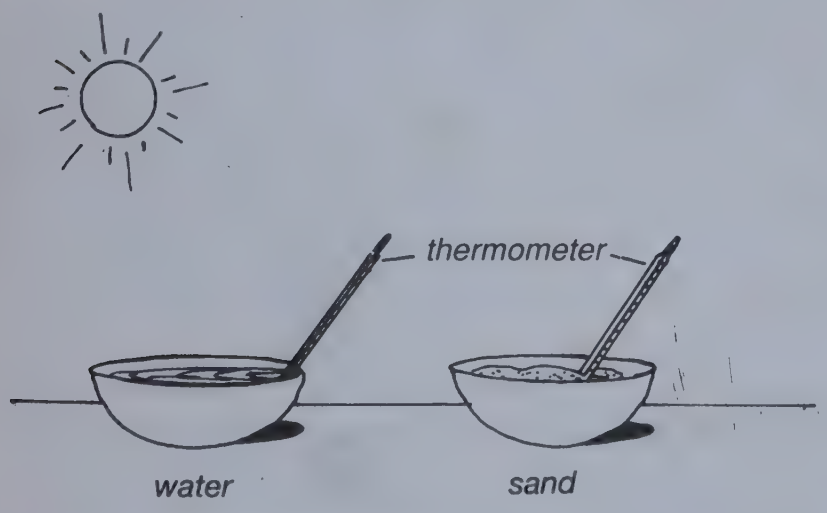
<u>You will need :</u>

* two plastic bowls,
* some water,
* some sand or earth,
* if possible, an outdoor thermometer.

We use a *thermometer* to measure how hot or cold the weather is. A thermometer tells us the temperature. The temperature at which water freezes is 0 degrees centigrade and the temperature at which water boils is 100 degrees centigrade. The temperature on this thermometer is 22 degrees centigrade (so the temperature is neither very cold nor very hot!).



A thermometer

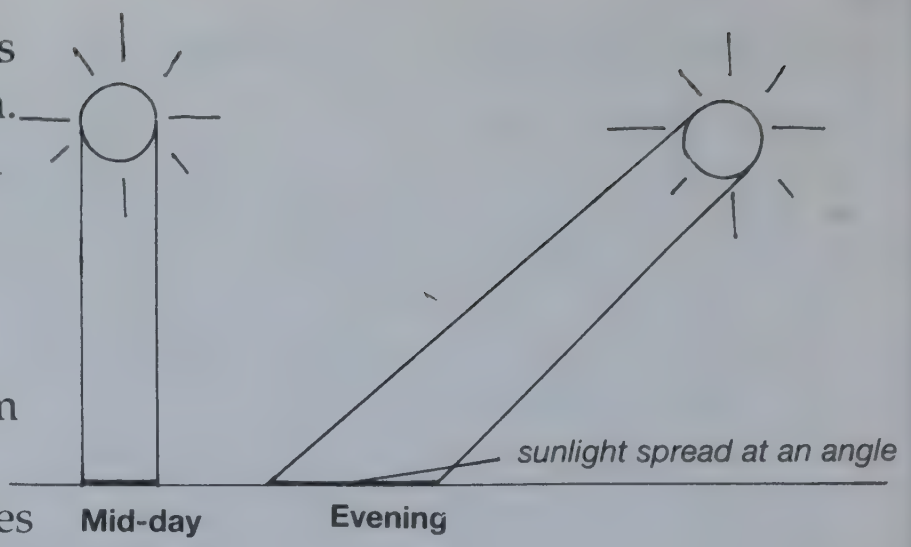


The temperature of a solid usually changes more quickly than the temperature of a liquid. Fill a plastic bowl with water and another bowl with sand. Put both these bowls in the sun for two or three hours. Find out which one gets hot more quickly. Then bring both the bowls inside. Leave them both for fifteen minutes. Which bowl stays hot longest?

You probably found that the bowl of sand got hot more quickly. This is because solids get hot more quickly than liquids. You probably found that the bowl with water in it stayed hot longest after you brought it inside. This is because solids get cold more quickly than liquids.

The land is a solid. The sea is a liquid. Places near the sea do not change temperature much. This is because the water keeps the air cool in the summer and keeps the air warm in the winter.

The temperature usually gets hotter in the middle of the day because the sun shines from right above us. In the early morning and evening, it is cooler because the sunlight shines at an angle. So it is spread over a wider area.



Tick the sentences which are true. Cross the sentences which are not true.

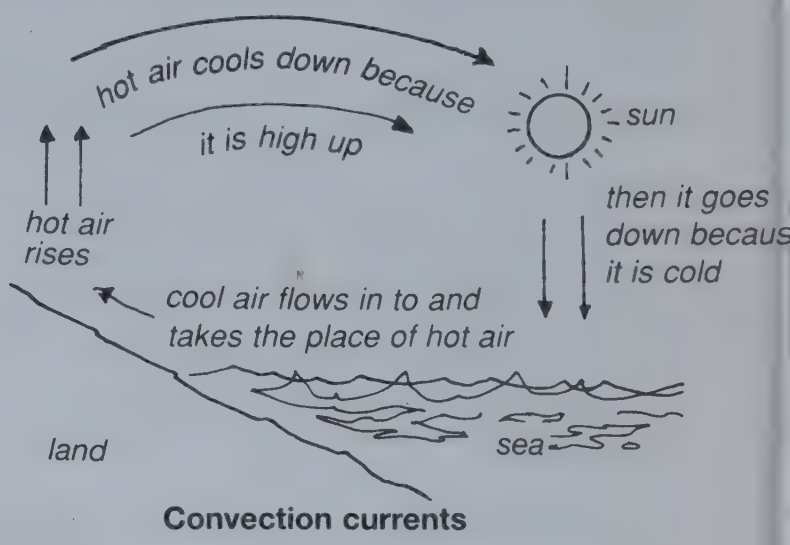
1. A thermometer measures temperature. [ ]
2. The temperature at which water freezes is 100 degrees centigrade. [ ]
3. A bowl of water gets hot more quickly than a bowl of sand. [ ]
4. A bowl of water cools down more slowly than a bowl of sand. [ ]
5. Places near the sea do not change temperature a lot. [ ]
6. It is cool in the morning and evening because the sun shines straight down at us. [ ]
7. It is hottest in the middle of the day because the sun shines straight down at us. [ ]

C. Wind

Wind is moving air. We can't see the wind, but we can feel it. It can help us by pushing sailing boats and drying clothes. It can also be dangerous when it blows too hard. Here are some reasons why there are winds.

CONVECTION CURRENTS

We have learned that there is air all round the earth. When air gets hot, it goes up. Hot air always rises. When the hot air goes up, the cool air flows in to take the place of the hot air and this makes a wind. These winds are called *convection currents*.



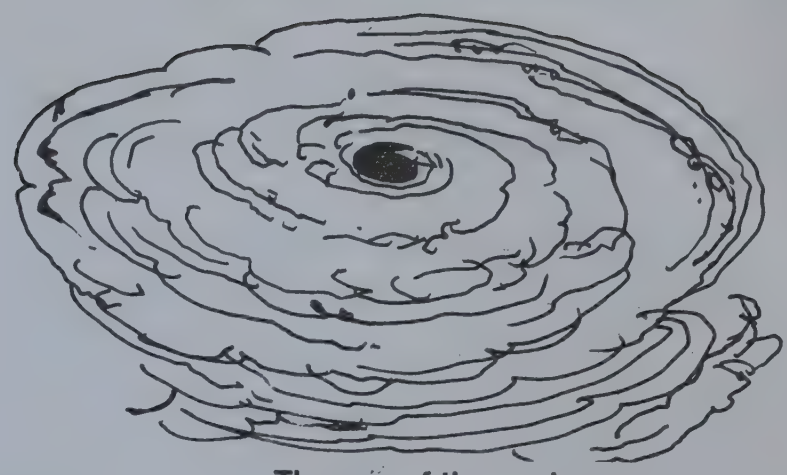
Convection currents

SEA BREEZES

A breeze is a light wind. If you live near the sea in a coastal area, you will know that there are usually sea breezes. In the day time, the air over the land gets heated up because land gets hot more quickly than water. Cool air from the sea blows in to take its place. In the night, the land cools down more quickly than the sea. So the warmer air over the sea rises and the cool air from the land blows in to take its place.

CYCLONES

Sometimes, when warm air full of water vapour rises from the sea, very strong wind rushes in to take its place. Big rain clouds form. The strong wind pushes these clouds around a centre called the eye of the cyclone.



The eye of the cyclone

Damages caused by cyclone

Cyclones blow into coastal areas but die out before they go far inland. Sometimes people who live near the sea lose their houses and even their lives. Cyclones can cause terrible damage.

Earth spinning on its axis

ROTATION OF THE EARTH

As we have already learned, the earth spins on its axis every twenty-four hours. This makes winds blow just as you feel a breeze on your face when you go round on a merry-go-round. Although most of the air goes round with the earth, the movement does cause some winds. As the earth has mountains and hills, the winds get pushed in different directions.

Complete this paragraph with words from the box (you will not need all of the words):

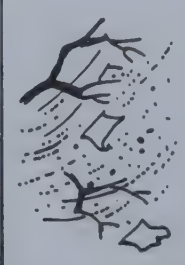
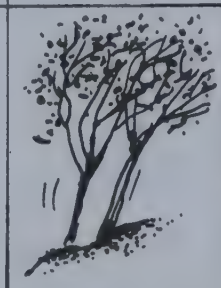
cyclones	sea	rises	damage	land	cooler
air	warm	quickly	spins	slowly	falls

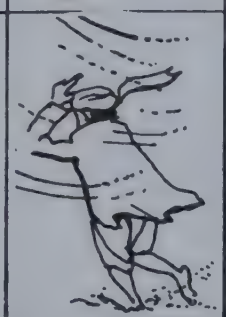
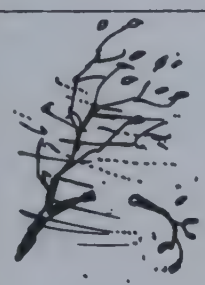
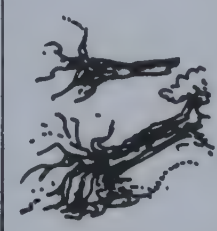
Wind is moving ..... . There are convection currents when hot air ..... and ..... air comes in to take its place. There are sea breezes because the sun warms the land more ..... than the sea. So the ..... air over the land rises and the cooler air from the ..... blows in to take its place. ..... form over the sea and can cause terrible ..... . Winds also form because the earth ..... round on its axis.

D. Measuring the wind

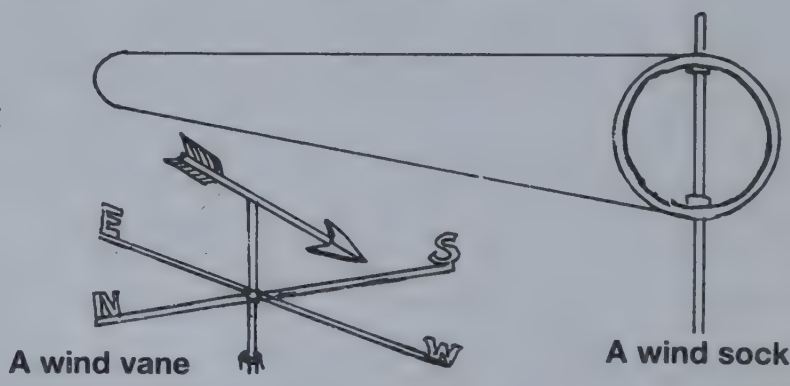
The *Beaufort Wind Scale* tells us how hard a wind is blowing. Sailors and pilots use it to help them decide whether it is safe to go out.

The Beaufort wind scale

Force	0	1	2	3	4	5	6
	Calm	Light air	Light breeze	Gentle breeze	Moderate	Fresh	Strong
							

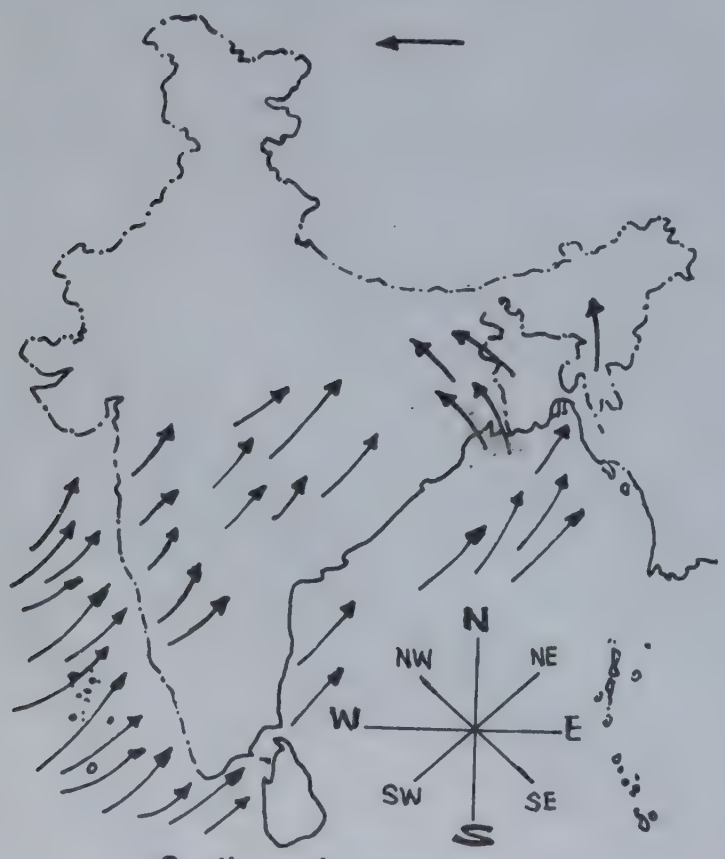
Force	7	8	9	10	11	12
	Moderate gale	Gale	Strong gale	Whole gale	Cyclone	Bad cyclone
						

Wind socks or *wind vanes* tell us where the wind is coming from. For example, if a west wind is blowing, it is coming from the west.



A wind vane

A wind sock



South-west monsoon

In May, June, July and August, the wind in India usually comes from the south-west. It brings big rain clouds from the Arabian Gulf. This is the south-west monsoon. In October, November and December, the wind usually comes from the north-east. It brings rain clouds from the Bay of Bengal to southern India. This is the north-east monsoon.

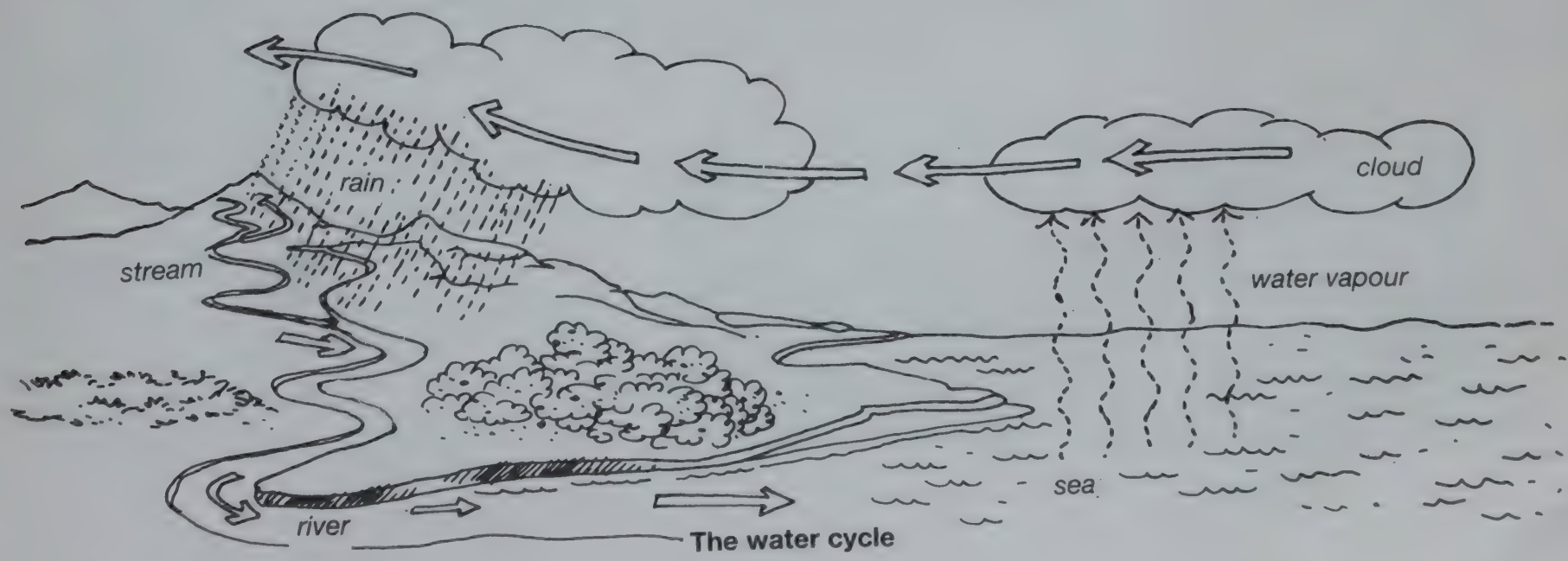
North-east monsoon

Draw a table of the Beaufort Scale. Make up your own pictures to illustrate each wind speed.

G. The water cycle

Do you know what happens when you put salt in a pan of hot water? The water tastes salty, but the steam does not. The sea tastes very salty. The sun shines down on it every day. Some of the water in the sea evaporates. It is like the steam from the pan of water. When water has turned into a gas, we call it water vapour.

The water vapour goes up into the sky and makes clouds. The clouds blow over the land. When the clouds go high,the water vapour in them cools and gets condensed into rain. The rain falls on the hills. It makes streams and then big rivers. The rivers flow back into the sea. So the water cycle starts all over again!



The water cycle

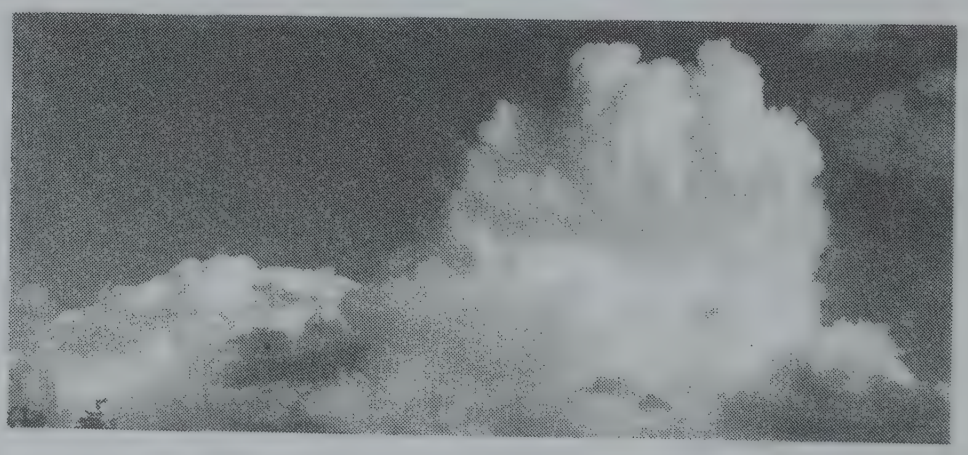
Complete these sentences. Use one word twice.

clouds	cold	rain	again	rivers	land	sea

1. Water evaporates from the ..... .
2. It goes up into the air and makes ..... .
3. The clouds blow over the ..... .
4. When the clouds go up, they get.....and the water vapour condenses into ..... .
5. The rain flows downhill and makes ..... .
6. The rivers flow back into the ..... .
7. The water cycle starts all over ..... .

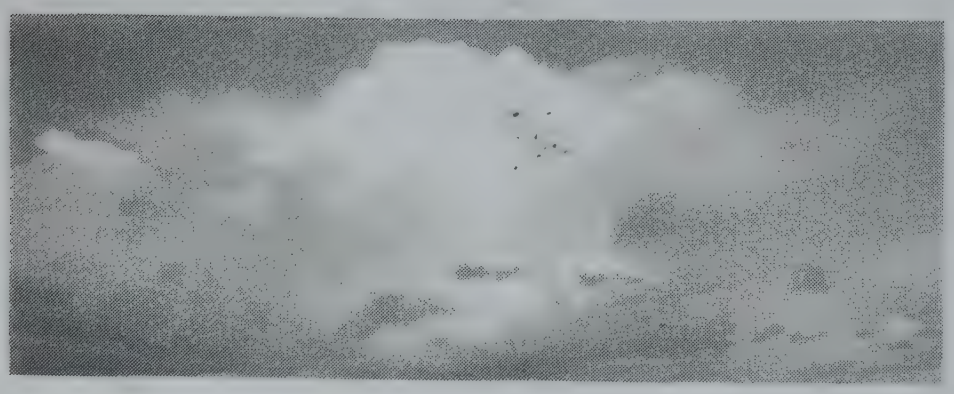
E. Clouds and rain

Clouds are made of thousands of tiny drops of water. They form from water vapour which has evaporated from the earth. There are three main kinds of cloud—*cumulus, stratus* and *cirrus* clouds.



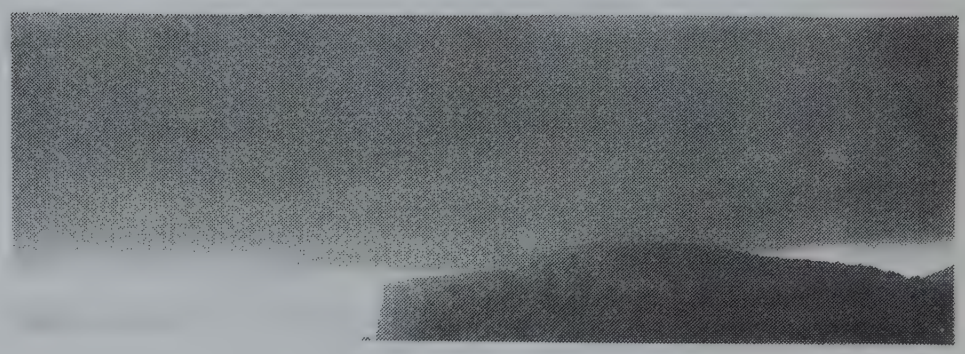
Cumulus clouds

Cumulus clouds are sometimes white and fluffy. Very big, grey cumulus clouds are called *cumulonimbus clouds*. They usually bring heavy rain and thunder storms.

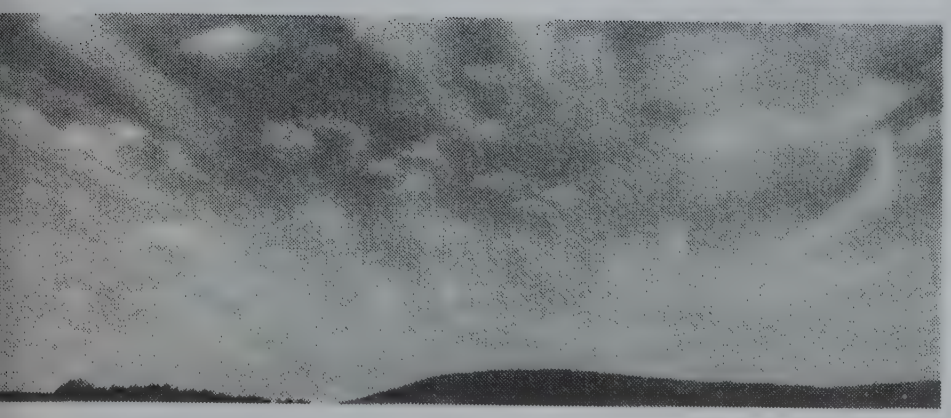


Cumulonimbus clouds

Stratus clouds form a layer. They usually from when the sky is grey all over.



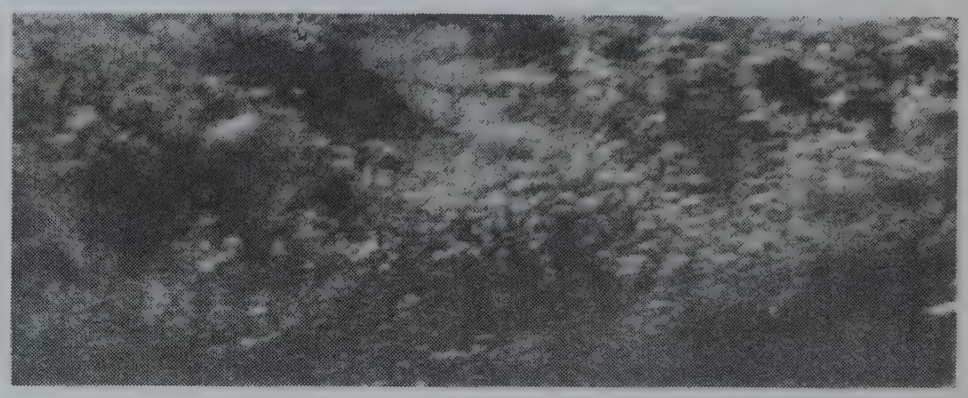
Stratus clouds



Cirrus clouds

Cirrus clouds are usually very high. They are often light and feathery.

All these cloud types can be mixed with each other. For example, *cirrocumulus* cloud is a mixture of cirrus and cumulus.



Cirrocumulus clouds

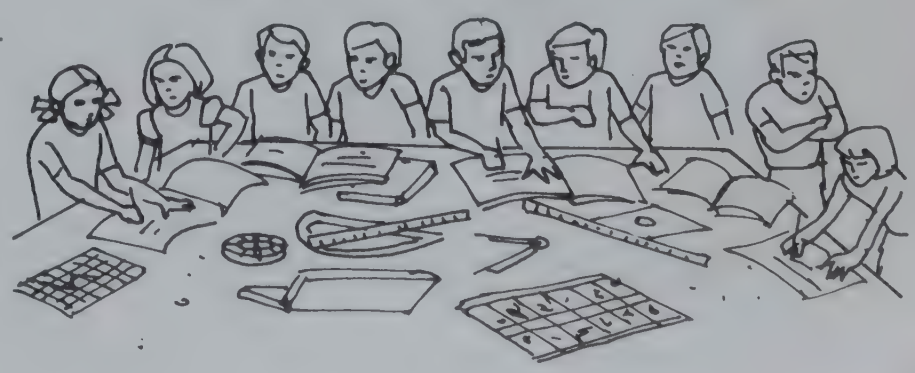
Try to identify the clouds in the sky and draw neat diagrams of each of them.

F. Making weather graphs

You will need :

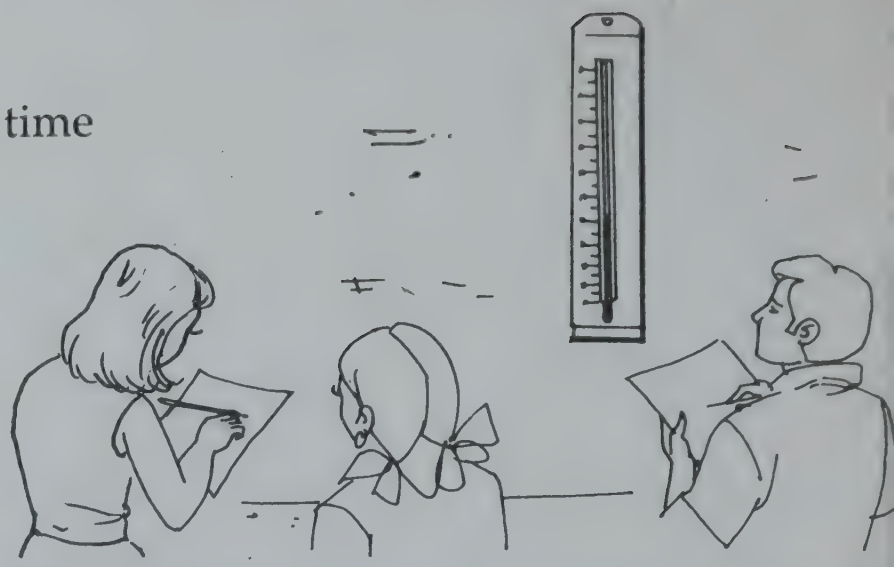
- an outdoor thermometer
- a tin or jar with a funnel of the same width
- a ruler or measuring stick with zero right at the bottom
- if possible, a compass
- a piece of light thread
- a large sheet of graph paper for each child. If this is not available, rule your own lines in centimetre squares.

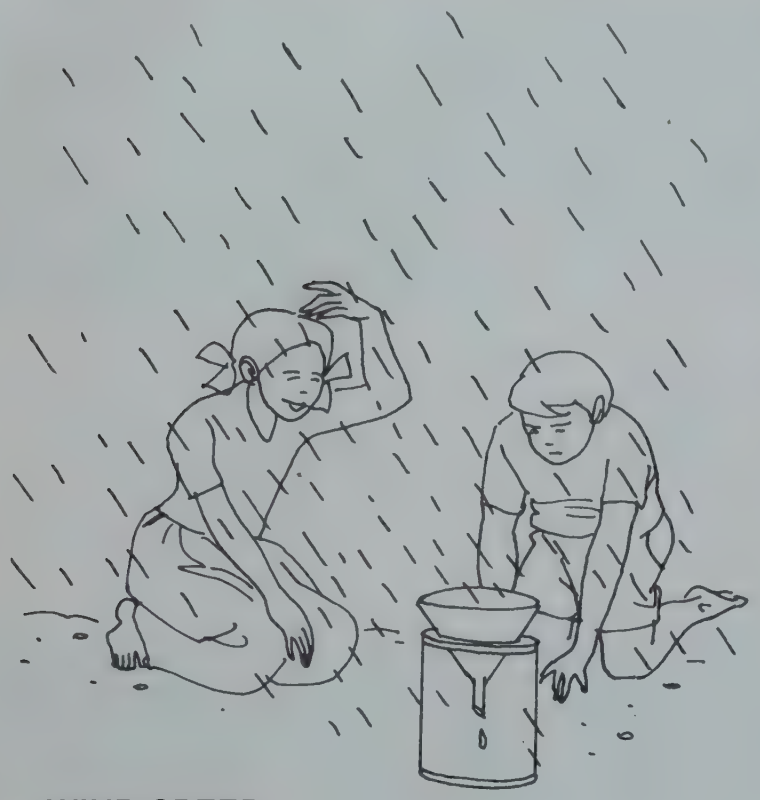
Some students of Class 4 A made some weather graphs over two weeks. They measured the change in temperature, level of rainfall, wind speed, wind direction and cloud type to show in their graph.



TEMPERATURE

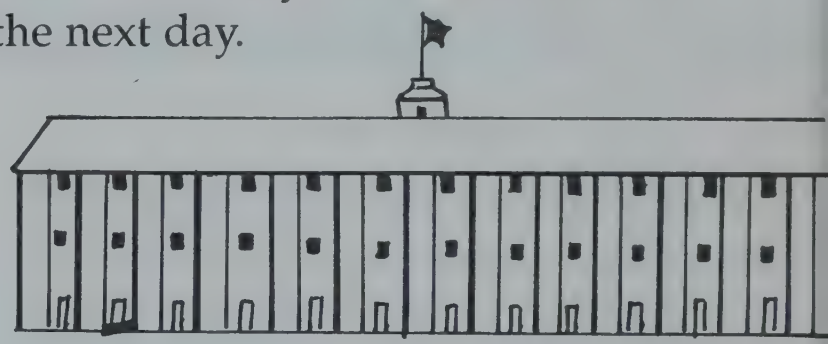
They measured the temperature at the same time each day using a thermometer.





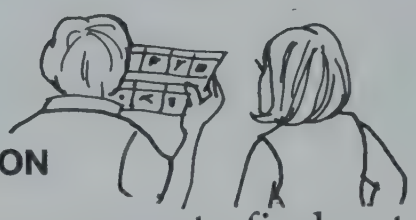
RAIN

They put a kerosene funnel in an old milk tin which had the same width as the funnel. They put the tin in an open space. They measured the amount of rain which fell each day, then poured out the water so that they could measure how much fell the next day.



WIND SPEED

They used the Beaufort Scale to estimate the wind speed.



WIND DIRECTION

They used a compass to find out which direction the wind was coming from. They held up a light piece of thread and noted which way it blew. (If you do not have a compass, estimate the positions of north, east, south and west from the position of the sun and write N, E, S, W with a chalk cross on the ground.)

CLOUD TYPE

They wrote down what type of clouds were in the sky.

This is the graph they made.

TEMPERATURE

Temperature

45 °C
40 °C
35 °C
30 °C
25 °C
20 °C
15 °C
10 °C
5 °C
0 °C

RAIN FALL

Height

25 mm
20 mm
15 mm
10 mm
5 mm
0 mm

	4	5	6	7	8	9	10	11	12	13	14	15	16	17
WIND SPEED	1	2	0	1	4	3	1	2	4	5	2	4	1	2
WIND DIRECTION	W	SW	–	SW	S	SW	S	W	SW	SW	SW	W	SW	SE
CLOUD TYPE	Cirrus	Cumulus (not many)	No cloud	No cloud	Stratus	Stratus	Cumulus	Cumulus	Cumulus	Cumulonimbus	Cumulonimbus	Cumulonimbus	Cumulus	Cumulus

DATES IN OCTOBER ON WHICH THE MEASUREMENTS WERE MADE

Over the next two weeks, make your own weather graphs. Use a sharp pencil and a ruler to draw the lines. Try to keep them neat.

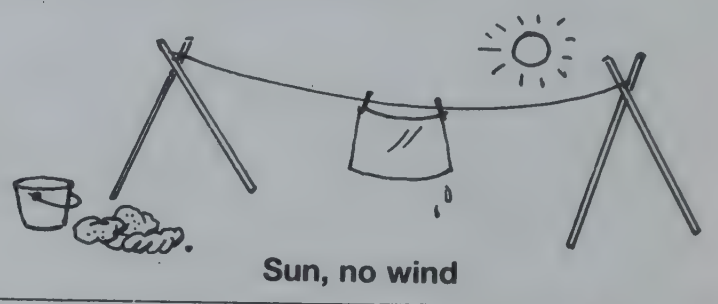
H. Evaporation

You will need :

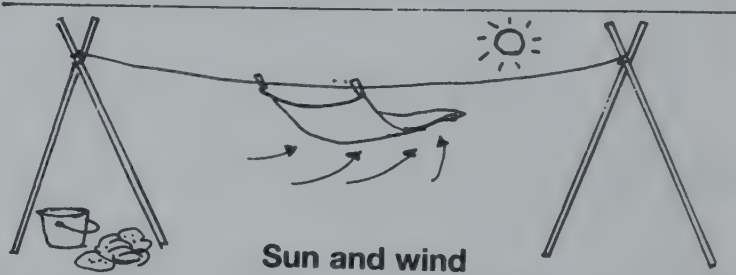
- six pieces of cloth of the same material and size,
- water.

We have learned that when water turns into a gas (water vapour) it *evaporates*. In this lesson we will do an experiment to find out when water evaporates fastest.

Take six pieces of cloth and wet them. Put one in a place where there is sun but no wind. Put the second piece in a place where there is both sun and wind and the third piece in a shady place. Crumple three more pieces of cloth into balls and put one beside each of the other pieces of cloth and leave them for two hours.

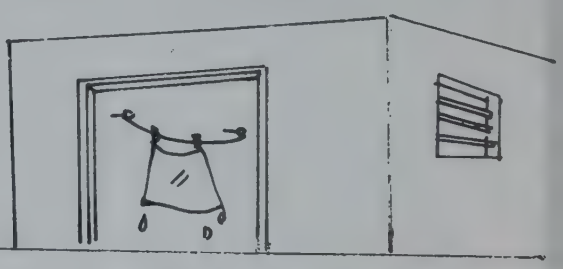


Sun, no wind



Sun and wind

Remember to do a *fair test*. The six pieces of cloth must be of the same material and size. You must make sure that the are all as wet as each other. You must leave them all to dry for the same length of time.



No sun, no wind

Before you do the experiment, write in your notebook the points given below in the order you guess they will come—the dryest at the top and the wettest at the bottom.

- crumpled in the shade
- spread out in the shade
- crumpled in the sun and wind
- spread out in the sun and wind
- crumpled in the sun and out of the wind
- spread out in the sun and out of the wind

Then do the experiment.

After the experiment, write the order in which they came, dryest at the top, wettest at the bottom. How many did you guess right?

I. Condensation

We have learned that when water vapour turns into water drops, it condenses. Water vapour can condense in many different ways.

DEW

In the morning, we often find that the ground is wet. There are drops of water on the ground. This is because the cold night air cools the water vapour in the air and condenses it into small drops of water. These water drops are called the *dew*.

Dew

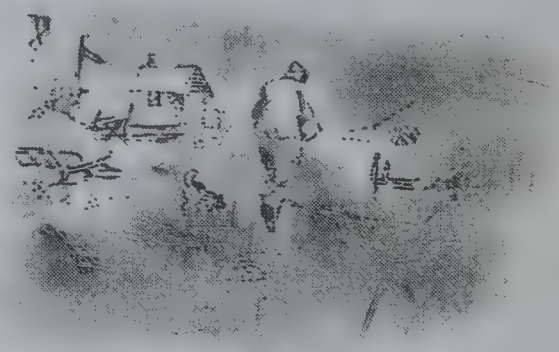
Frost

FROST

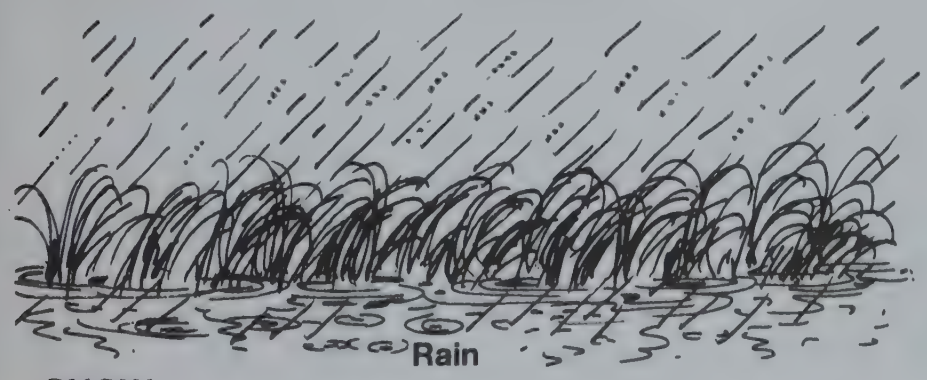
On winter mornings in colder parts of India, there may be *frost*. If the temperature is below freezing (zero degrees centigrade), dew turns into frost. Frost is white and powdery. It can damage many plants.

CLOUDS, MIST AND FOG

When water vapour condenses into tiny drops of water in the air, it forms cloud. If we are in the middle of cloud, we call it mist or fog. If you go up a mountain or up in an aeroplane, there is cloud all around you and you cannot see very far. Sometimes, mist forms near lakes and rivers on cool mornings.



Fog



Rain

RAIN

It rains when the water droplets in clouds become too heavy to stay in the air. All crops need rain, but very heavy rain can damage crops and cause floods.

SNOW

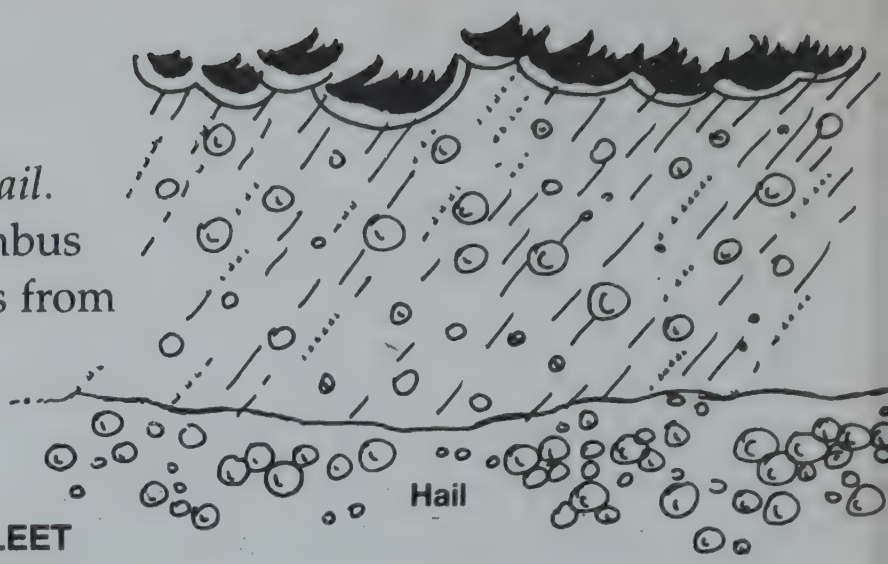
When the temperature is below freezing, water vapour freezes in the air. Then *snow* falls instead of rain. If you look at snow crystals under a magnifying glass, they are all different and have lovely patterns with six points.

Snow crystals

HAIL

Sometimes rain freezes into lumps of ice called *hail*. Hail usually falls fast in a storm with cumulonimbus clouds which go high into the air. The hail comes from the cold, high parts of the cloud.

Sleet



SLEET

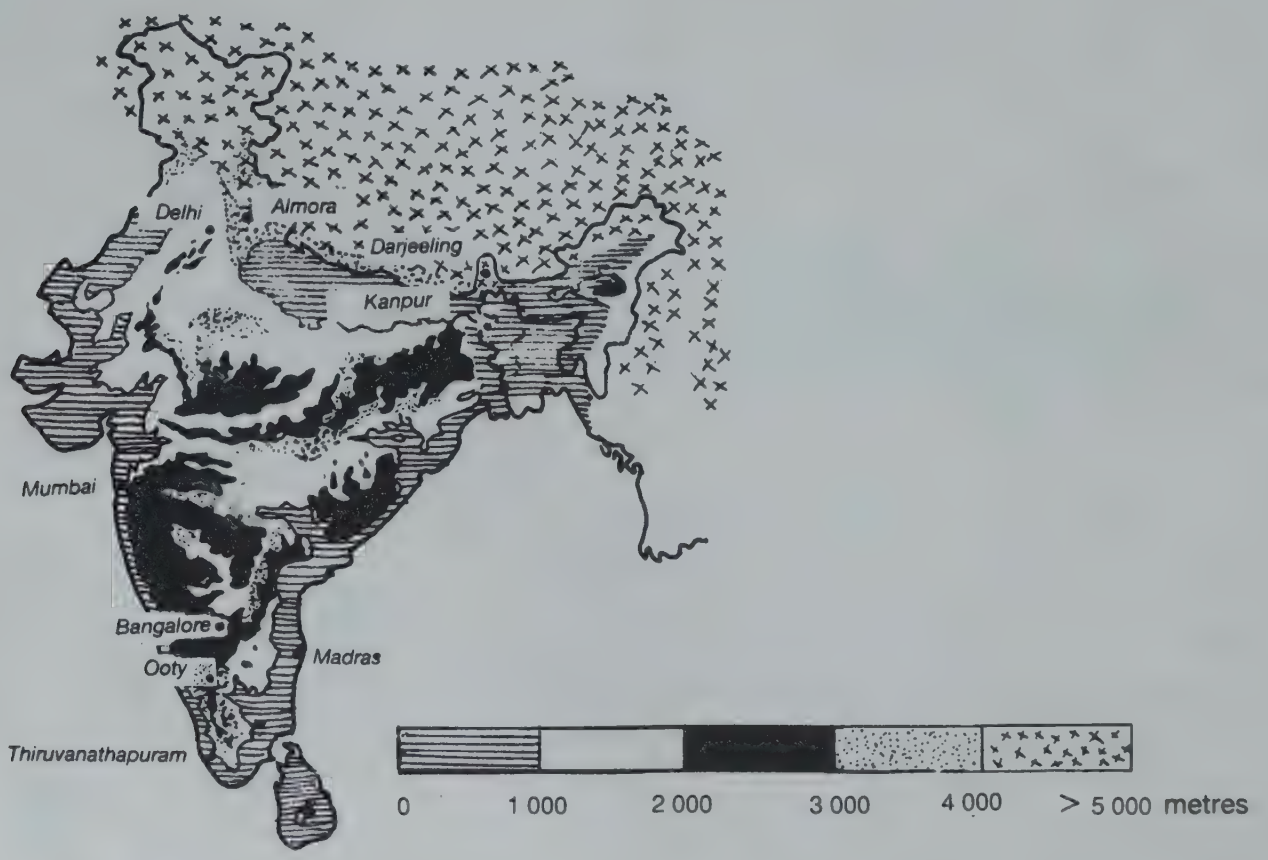
Sleet is a mixture of snow and rain.

Fill in the blanks.

1. ..... crystals have six points.
2. ..... forms on the ground when the cold of the night condenses water vapour in the air.
3. ..... forms when water droplets in clouds become too heavy to stay up.
4. ..... is frozen dew.
5. ..... is frozen rain which falls as balls of ice.
6. ..... are made of tiny droplets of water vapour in the air.

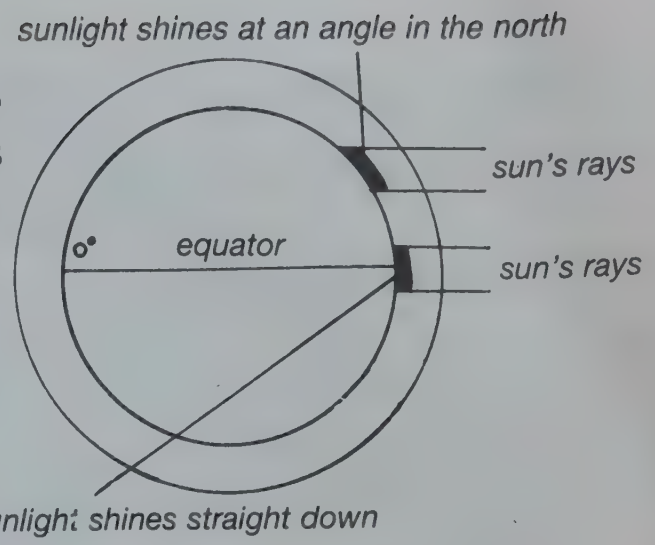
J. The climate

The climate is the *weather* of a place during the year. There are many different kinds of climate in India.



Relief map of India

In Almora, in the Himalayas, there are very cold winters with frost and snow. The summers are warm, not hot. This is because the air gets colder the higher you go. Almora is over 2 000 metres high, so it is cold. It is also in the north of India. So it is quite a long way from the equator. We have learned that places near the equator are usually warmer than places nearer the North and South Poles. This is because the sun shines straight down at them.



In Delhi, the winters are so cold that you need warm sweaters. Sometimes there is a frost, but there is no snow. Delhi is on low ground, so it does not get as cold as Almora. The summers in Delhi can be very hot. This is because Delhi is not near the sea. The sea keeps a place cool in summer and warm in winter.

In Madras, the temperature does not change much from summer to winter. This is partly because it is near the sea. It is also because it is further south than Delhi. So it is nearer the equator. It is warm all through the year, but the sea stops it from getting very hot. Madras is more humid than Delhi because water vapour evaporates from the sea and keeps the air moist.

Look at the different places on the map. Think: Is it high or low? Is it near or far from the sea? Is it near or far from the equator? Then make six (or twelve if you have time) sentences from the table below:

I guess that	Kanpur Ooty Mumbai Darjeeling Triruvanathapuram Bangalore	is usually	humid very hot hot warm cool very cold	in summer. in winter.

Revision

I. Answer these questions:

1. Which gets hot more quickly if you put it in the sun—sand or water?
2. Does hot air go up or down?
3. Would you get sea breezes in Delhi or Mumbai?
4. What is the middle of a cyclone called?
5. What does the Beaufort Scale tell us?
6. If there is a west wind, is the wind blowing from the west or to the west?
7. What kind of cloud would there be in a thunder storm—cumulus, cumulonimbus or cirrus?

II. When you have finished your weather graphs. complete these sentences:

1. The warmest day was ..... (date). The temperature was ..... degrees centigrade.
2. The coolest day was ..... (date). The temperature was ..... degrees centigrade.
3. The wettest day was ..... (date). ..... millimetres of rain fell that day.
4. The wind was most often from the ..... (north/south/east/west).
5. The most common wind speed was ..... on the Beaufort Scale.
6. The most common cloud type was ..... (cumulus/cumulonimbus/cirrus/stratus).

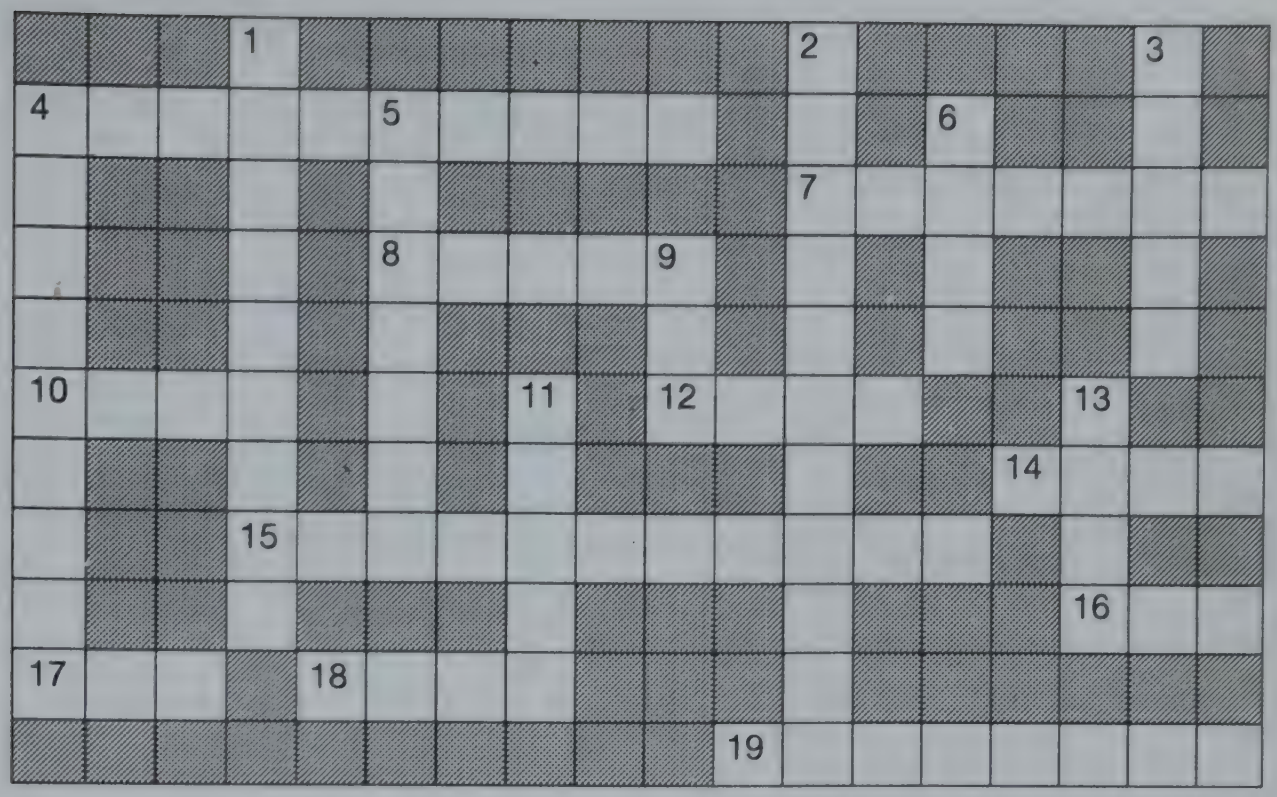
III. Do this weather crossword:

Clues across

4. ..... currents are caused when warm air rises and cool air comes in to take its place.
7. The south-west ..... brings rain from May to July.
8. Cirrus, stratus and cumulus are all types of ..... .
10. Does snow .....fall in Hyderabad? No, it doesn't.
12. The summers in Almora are not cold, but they are not very hot either; they are ..... .
14. A.....is a very strong wind, but not as strong as a cyclone.
15. We measure the temperature with a ..... .
16. It is hotter in .....places than it is in high places.
17. The temperature does not change a lot by the ..... .
18. The air above mountains is usually ..... .
19. You can estimate wind speeds with the help of the .....Scale.

Clues down

1. When pools of water ....., they turn into water vapour.
2. If we want to find how hot or cold it is, we measure the ..... .
3. .....is freezing dew.
4. When water vapour ....., it turns into drops of water.
5. A very strong wind which starts over the sea is called a ..... .
6. .....falls instead of rain when the temperature is below freezing.
9. If the ground is a little wet in the early morning, there is .....on the ground.
11. When there is a lot of water vapour in the air, we sweat because it is ..... .
13. When rain freezes into balls of ice, it becomes..... .



IV. Extension Work

Look at the weather graphs you have made. Write your own comments. (For example, Does the temperature go down when there is a lot of rain? What kind of clouds have there been on rainy days? Does it rain a lot when it is very windy? Does the direction of the wind affect the weather?)

UNIT 4

Food and Water

Key words

balanced diet : food with some starch, some protein, some vitamins and some minerals
diet : the food you eat every day
minerals : substances in food that protect our bodies against diseases
protein : substance in food that helps our bodies to grow big and strong
starch : substance in food that gives us energy
ulcer : a kind of boil inside the body
vitamins : substances in food that protect our bodies against disease

A. Food

A car will not move without fuel. Its fuel is petrol. People cannot live without fuel either. Our fuel is food. If we stop eating food, we will get ill and die.

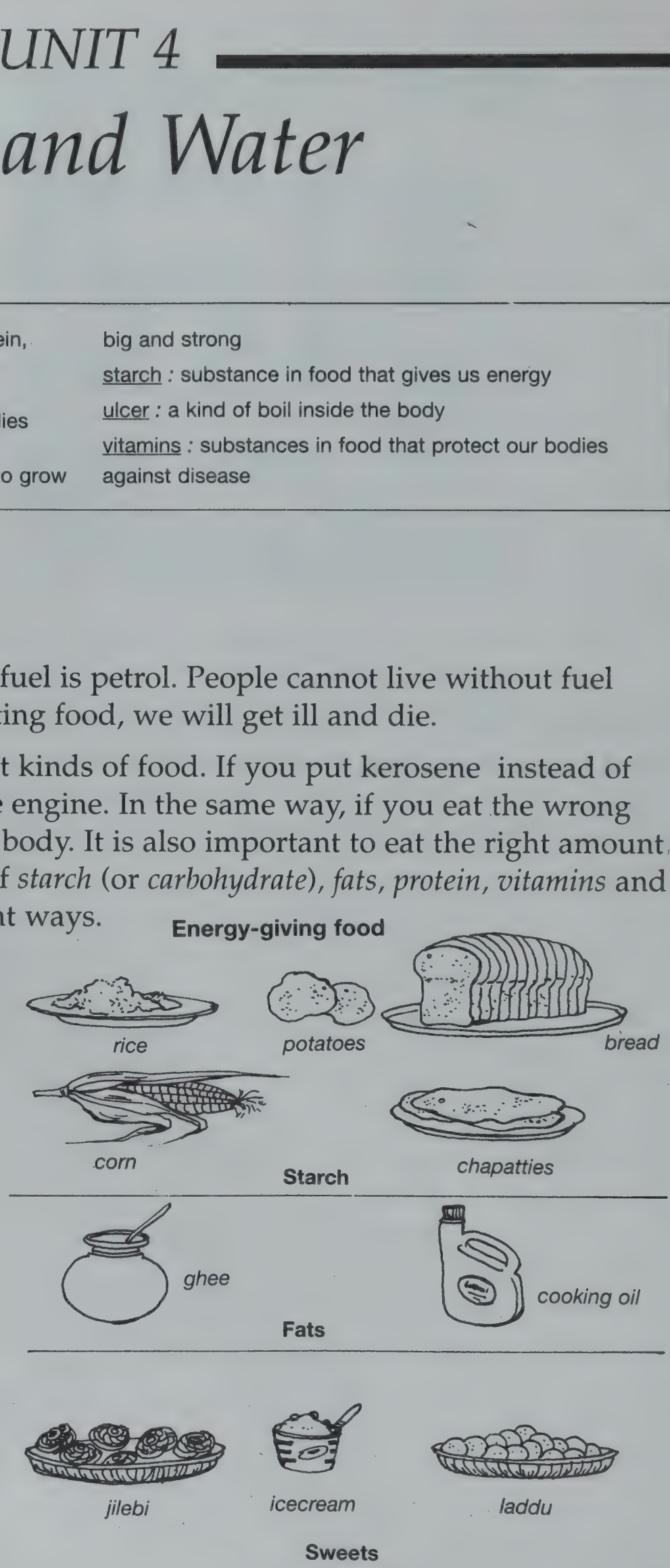
It is very important to eat the right kinds of food. If you put kerosene instead of petrol into a car, you will damage the engine. In the same way, if you eat the wrong kinds of food, you will damage your body. It is also important to eat the right amount of different foods. Food is made up of *starch* (or *carbohydrate*), *fats*, *protein*, *vitamins* and *mineral salts*. These help us in different ways.

DIFFERENT TYPES OF FOOD

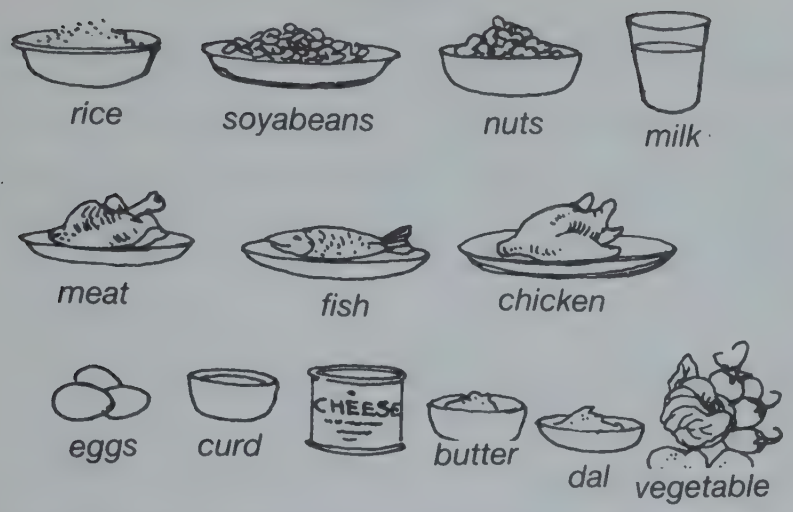
Energy-giving foods: Starch, sweets and fats give us energy to walk, run and jump. Rice, wheat, corn, javar and potatoes have a lot of starch in them. Starch is sometimes called *carbohydrate*.

Fats also give us energy which can be easily stored in the body. Ghee, butter and cooking oil are fats.

Sweets give us energy very quickly. People who work hard with their bodies need a lot of energy-giving foods.

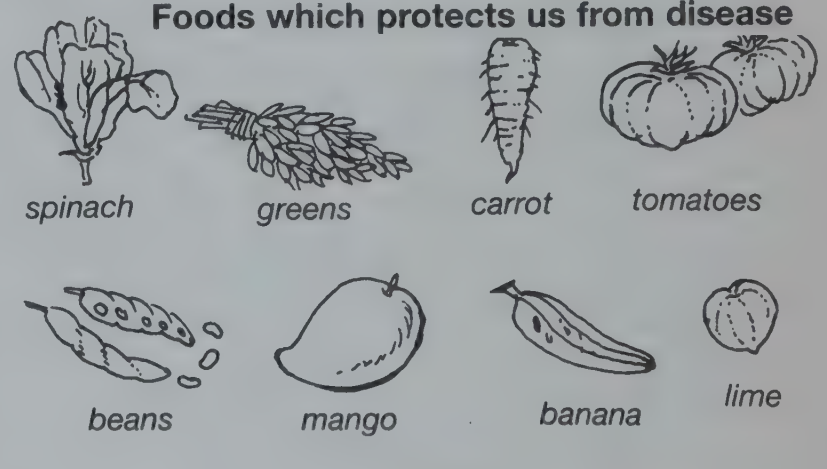


Body-building food



Body-building foods: There is protein in all body-building food. Protein helps us to grow big and strong. It also helps wounds to get better. There is protein in milk, meat, eggs, beans and dal. If you mix cereals (e.g. rice or rotis) with dal and vegetable, you get protein too. Brown rice contains more protein than white rice. Growing children need to eat a lot of protein.

Foods which protects us from disease



Foods which protect us from diseases : Fruits and vegetables have a lot of vitamins and minerals. Vitamins help our bodies to fight germs and keep healthy. For example, if we do not eat foods with vitamin A, our eyes may become weak. There is a lot of vitamin A in green leafy vegetables, papaya, mangoes and carrots.

If we do not get enough vitamin B, we feel weak and we may get skin diseases. There is vitamin B in beans, dal, groundnuts, meat and eggs.

If we do not eat enough vitamin C, we may get sore gums and bad colds. There is vitamin C in most fruit, especially limes, and green leafy vegetables.

There are also very small amounts of minerals in some foods. For example, meat, fish and green leafy vegetables contain iron. If we do not have a little iron in our food, we become weak.

Eggs and milk contain calcium. Calcium is good for our teeth and bones.

Make sentences from the following tables (you may use the same word twice).

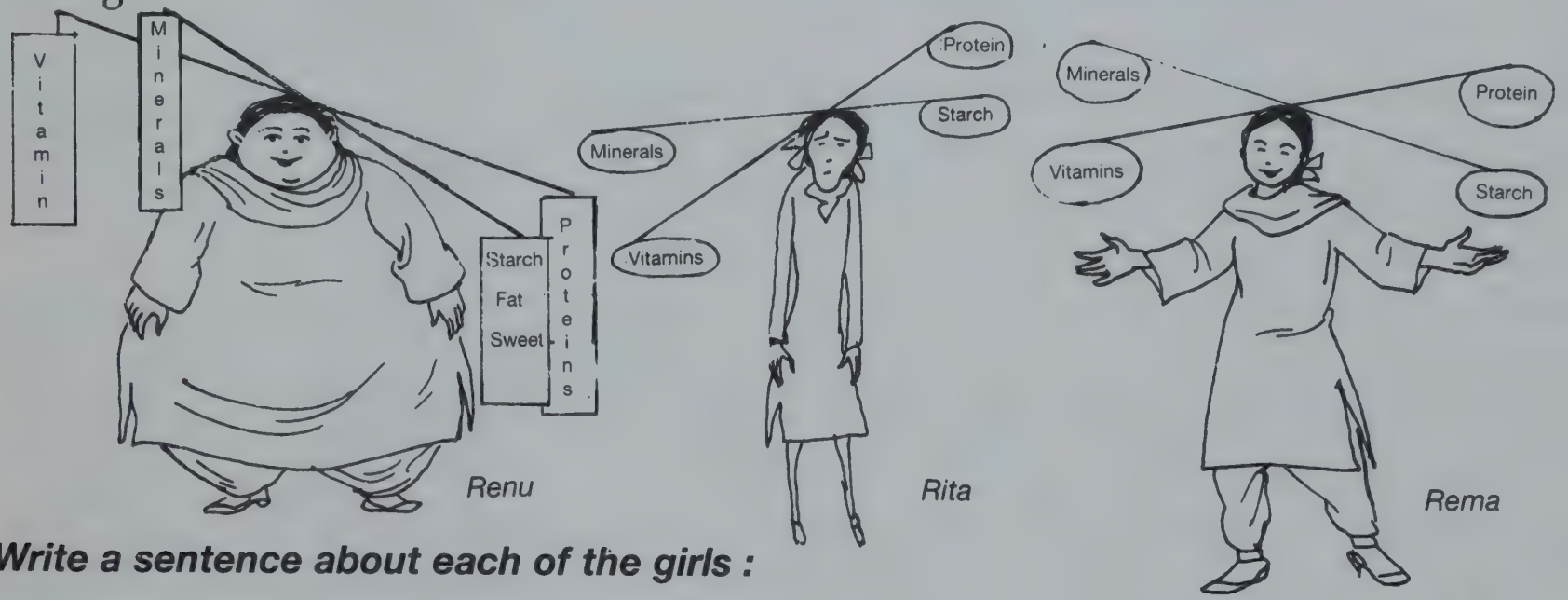
Foods with a lot of	starch protein vitamins	protect us from disease. give us energy. make us grow well.

There is a lot of	calcium protein vitamin A starch vitamin C iron fat	in	lemons. meat. cooking oil. mangoes. rice. eggs.

B. A balanced diet

Your diet is the food you eat every day. You should eat many different kinds of food. If you eat some starch, a little fat, some protein, some vitamins and some minerals, you have a *balanced diet*. If you eat too much starch and protein, you will become fat. If you eat too little starch, you will become thin. If you eat too little protein, you will become weak. If you eat too few vitamins, you will get ill.

Talk about these pictures in class and say what you think each girl eats. Which of these girls has a balanced diet ?



Write a sentence about each of the girls :

..... is | too fat | too thin | just right | because she eats .....

C. Planning a balanced meal

One day, Rita planned a balanced meal for her family. Then she helped her mother to cook it. This was her plan :

rice
boiled eggs with onions and tomatoes
frid cabbage with grated coconut
sprouted green gram in lime juice
moong dal with coriander
curd
sweat limes

Look at the different kinds of food in Exercise A. Plan two balanced meals — one for vegetarians, one for non-vegetarians. Make sure that each meal contains energy-giving food, body-building food and foods which protect you from disease.

D. Rema cooks a meal

"I'm going to cook the dinner, Ma,"said Rema. "You can go and read your book. I know what to do."

"What—all by yourself!" said her mother. "You can't !"

"Yes, I can. I've planned it. Please don't tell me what to do."

"All right," laughed her mother. "I won't tell you anything."

Rema began to cut up the onions.

"Hmm! Look at your hands," said Rema's mother. "They're very dirty. You can't cook with dirty hands."

"I was just going to wash my hands," said Rema. She quickly put down the knife. She washed her hands. Then she put the rice in a pan. "Go and sit down, Ma!"

"Rema," said her mother. "Have you cleaned the rice?"

"Yes,"said Rema. Quickly, she took the stones and dirt out of the rice. Then she washed it and filled the pan with water.

"Rema, that's much too much water," said her mother.

Rema felt angry. "Why can't she leave me alone?" she thought. But she said, " I can pour out the extra water after it has cooked. Grandmother does that."

"Grandmother doesn't know that she pours out the vitamins with the water," said her mother. "If you boil the rice dry, you will keep the vitamins in the rice."

"Ma, why can't we have nice white rice like my friend, Meena? You always buy this dirty brown rice."

"It isn't dirty. It has a lot of protein. The brown part of the rice makes you strong."

"All right," said Rema. "Now sit down and I'll cook."

Slowly, Rema's mother went into the other room. "Don't put too many chillies in the food, " she said from her chair. "We don't want to get stomach ulcers."

"I won't," said Rema. "At last I'm alone," she thought. She boiled the dal, rice and eggs. She cut up the onions, tomatoes and the cabbage. She grated the coconut. She put some oil into a pan. She mixed some green gram with lime juice. She started to sing. She liked cooking. "I can do this all by myself, "she said to herself."

Then her mother came into the kitchen. "I'm thirsty," she said. "I want some water." She looked at the green gram and then laughed loudly. "Rema," she cried. "This isn't sprouted green gram."

"Yes, it is! It says green gram here," said Rema, pointing to the packet.

"Eat it then. It isn't sprouted," said her mother.

Rema tasted the green gram in lime juice. It was very hard.

"Ow!" she said.

"Here's the sprouted green gram." Rema's mother pointed to a cloth. Inside the cloth was some green gram. Little green leaves were sprouting out of it. "I soaked the green gram for a day. Then I kept it in this wet cloth for two more days and the green sprouts grew. They're very good for you. Eat some." Rema tasted it. It is nice and crunchy, but not hard — mmm!

"You must wash it well. Uncooked food is good for you, but it must be clean," said her mother.

"Yes, I know,"said Rema. "Now, go and read your book."

"AAAAh! Look at the oil! There's much too much." Rema's mother took the oil off the stove and poured half of it into a cup.

Rema was angry. She wanted to cook by herself. "Please, Ma, let me do it."

Rema seasoned the dal and fried the cabbage.

"Turn off the cabbage, Rema," called her mother. "You will kill all the vitamins if you cook it for too long."

Rema was furious! "PLEASE, MA, LEAVE ME ALONE!" she said.

"All right. I will—and let's see if the family will eat it," said her mother angrily. She went out of the kitchen.

At last the meal was ready. All the family came to eat.

"Mmm, nice and crunchy!" said her sister. Her mouth was full of sprouted green gram.

"Very well-cooked rice," said her grandmother.

"Delicious cabbage," said her father. "It's not too oily and you didn't cook it too long."

"Yes, isn't Rema clever!" said her mother. "She did it all by herself."

She looked at Rema and they both laughed.

Rema wanted to cook by herself, but she learned a lot from her mother. What did she learn? Write ten true sentences with the help of this table:

We should We should not	cook with dirty hands. clean the rice before we cook it. throw away rice water because it contains vitamins. boil the rice dry, so that the vitamins stay in it. eat brown rice, because it has a lot of protein. eat a lot of chillies, because they can give ulcers. eat sprouted green gram because it is good for us. clean uncooked food well. eat too much oily food. cook vegetables for too long.

E. Testing for starch

You will need :

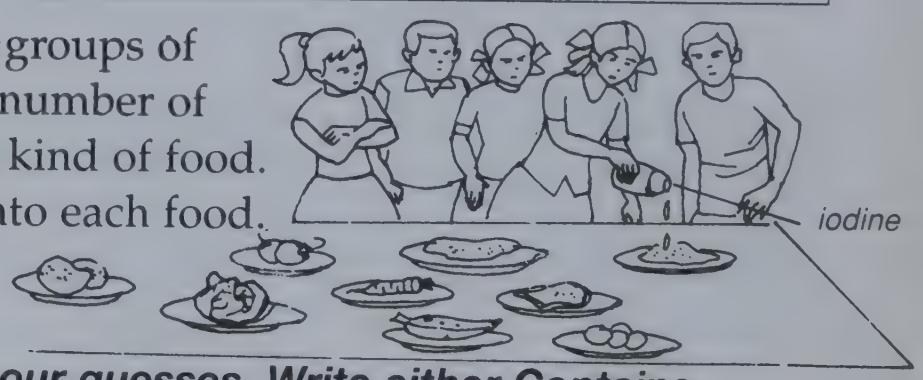
- some different kinds of food (e.g. a potato, a piece of cabbage, some cooked rice, a brinjal, a carrot, a cooked chapatti, some bread, a lime, a banana),
- a bottle of iodine (you can buy it at any chemist's),
- a knife to cut the vegetables and fruit,
- a plate for each group of five or six children.

Draw a table like this in your notebook. This is only an example. You should write the names of the foods you are going to test. Guess which foods have starch and tick them under *my guess* column. One is ticked for you. It does not matter if your guesses are different from your friends' guesses. Think for yourself!

STARCH TEST

food	***my guess***	***the result***
cabbage		
cooked rice	✔	
brinjal		
carrot		
chapatti		
bread		
lime		
banana		
potato		

After you have made your guesses, get into groups of five or six. Divide each of your foods into the number of groups. Give each group a small piece of each kind of food. Put them on a plate. Put one drop of iodine onto each food. Those which turn blue have starch in them.



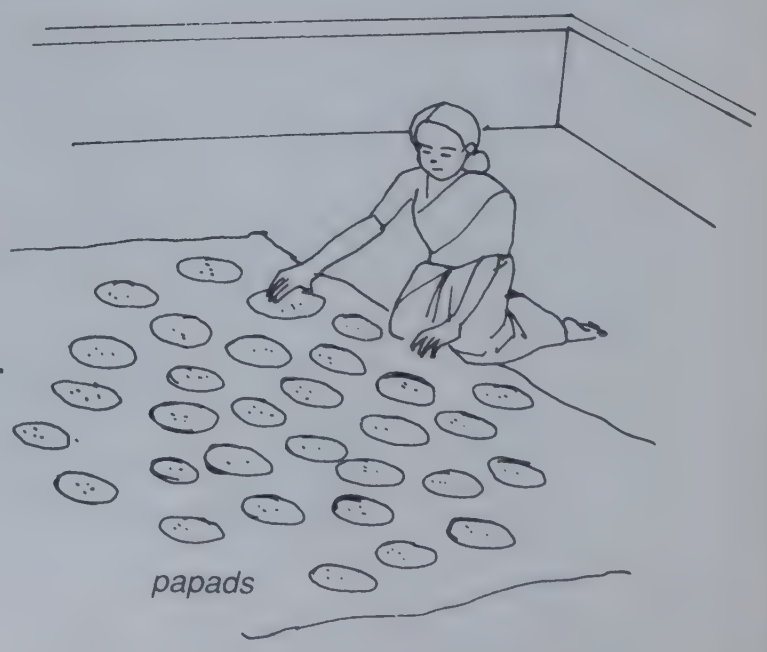
Record the results of your starch test beside your guesses. Write either Contains starch, Does not contain starch, or Contains a little starch.

F. Keeping food for a long time

Many kinds of food go bad after some time. There are lots of ways of stopping this from happening.

DRYING FOOD

We can dry some kinds of food in the sun. For example, if we make papads, we can dry them in the sun and then keep them for several months before we fry them. It is important to store such foods in dry containers. If you let rice or dal get wet, it will go bad. Sometimes we put food in the sun because there are insects in it. For example, weevils eat rice and wheat. If we put the grain in the sun, the insects go away.

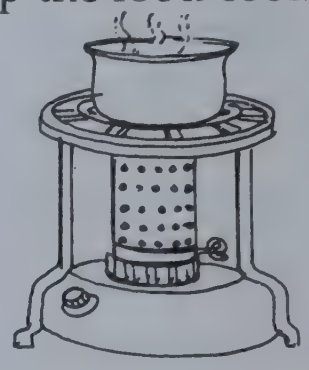


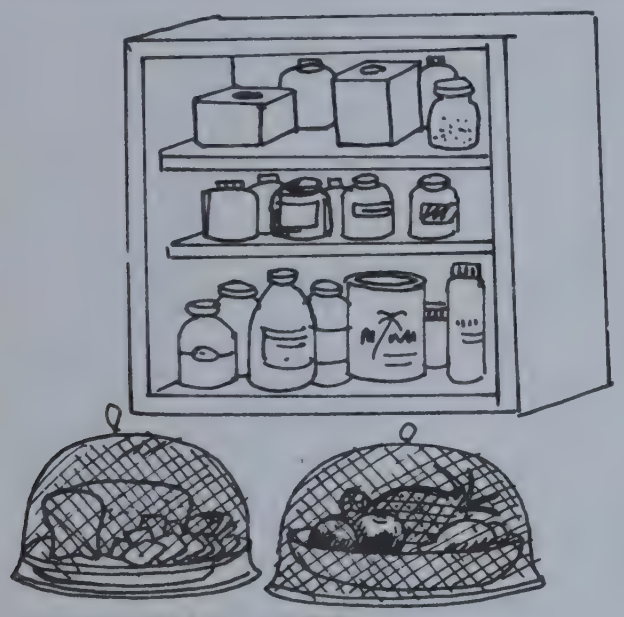
KEEPING FOOD COOL

We can keep food longer if it is cool, especially cooked food. That is why some people have fridges. People keep meat, milk, vegetables, fruit and eggs in a fridge for several days. You can also keep food cool by putting it inside a container of water. Put a cloth over the food and let it fall into the water. The water will keep the food cool.

BOILING FOOD

If you boil food, you will kill germs for a short while. For example, if you boil dal in the morning, you can keep it for a few more hours. But you should not cook meat more than twice.



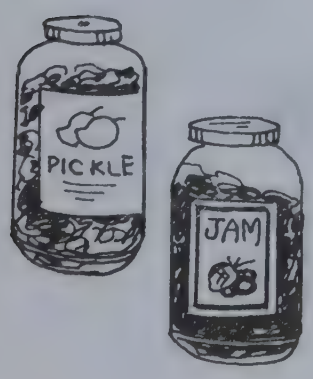


KEEPING FOOD, IN TINS OR JARS

Tins and jars have tight lids. The lids keep out the air. In the air there are germs which will rot the food. There is also water vapour in air. Food goes bad if it is wet. Flour, biscuits, bread and sugar will remain good if you put them in a dry tin or jar with a tight lid. The lid also keeps away harmful insects (like flies) and animals (like rats). Only store dry food in this way. Wet food like fruit will go rotten. (Remember the experiment with decay in Unit 2!)

FERMENTING FOOD

Milk goes bad quickly. It keeps for an extra day or two if you make it into curd. Curd is *fermented milk*. Curd is good for you and can help to make you better if you have *diarrhoea*. Idlis are made of fermented rice flour and urad dal. If you leave the mixture overnight, the taste changes. Idlis are good for diarrhoea because fermented food helps you fight bad germs. (They are also good for you because they have no oil and do not lose vitamins while cooking.)



MAKING PICKLES AND JAMS

Salt stops food from going bad. We can mix fruit or vegetables with salt. Then we can put them in a dry jar mixed with oil and spice. In this way we make pickles. We can eat fresh mangoes only in summer, but we can eat mango pickle all through the year. Sugar can also stop food from going bad. We can keep fruits all year if we boil them with sugar and make jam.

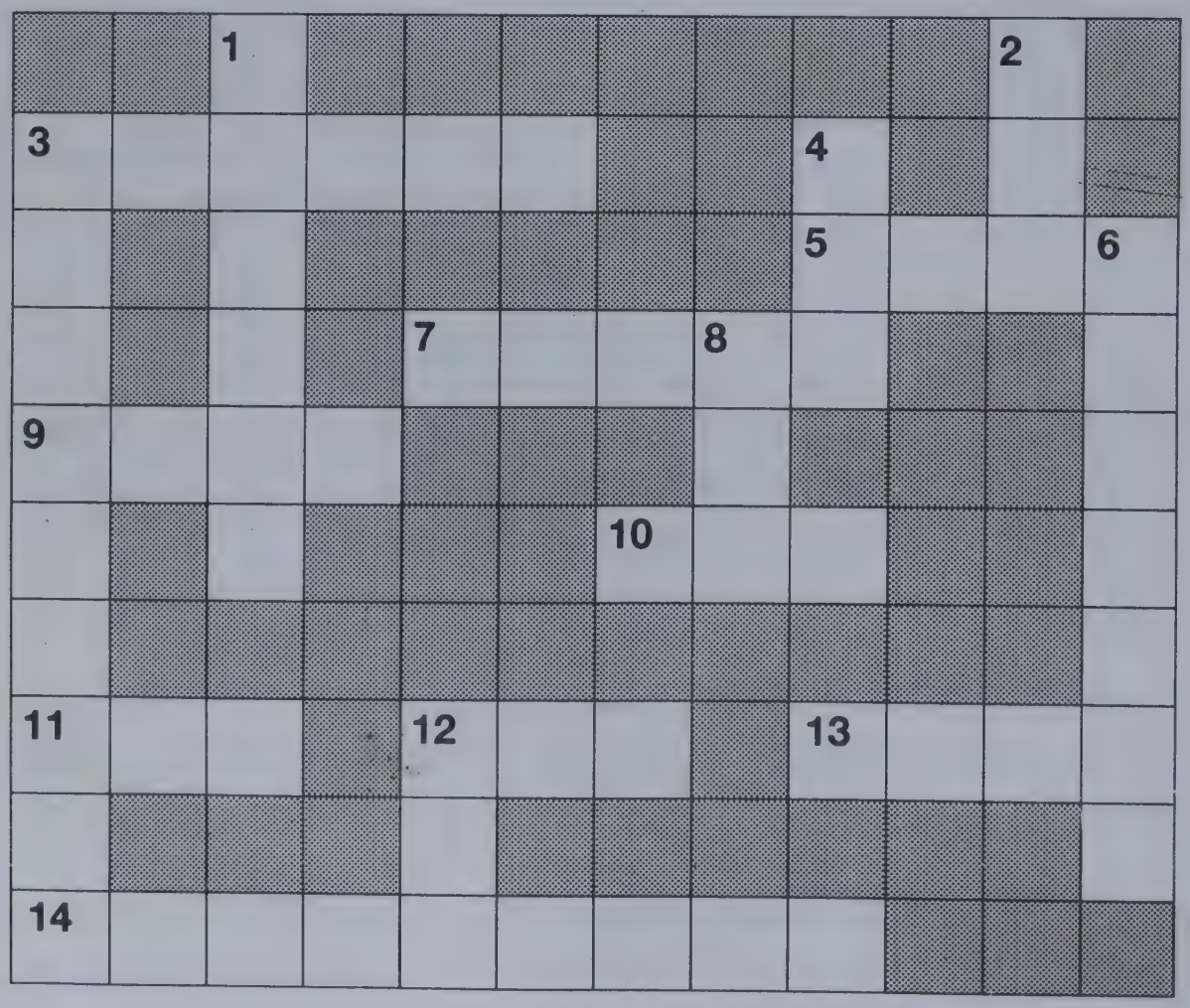
Do this crossword :

Clues across

3. You can keep food cool in a ..... .
5. This is made of fermented rice flour and urad dal.
7. You can dry this in the sun and fry it several months later.
9. Curd is made of fermented ..... .
10. It is important to store food in .....containers.
11. We can keep food dry in a jar or a ..... .
12. We make .....by boiling fruit with sugar.
13. .....can stop food from going bad.
14. Fermented food is good for people with ..... .

Clues down

1. We make ..... by mixing fruit or vegetables with salt, oil and spices.
2. We can keep ..... for a few extra hours if we boil it.
3. Curd is made of ..... milk.
4. We should keep the ..... on a tin to keep out air.
6. If we put rice or wheat in the sun, ... like weevils will go away.
8. There are germs and water vapour in the ..... .
12. We can keep food dry in a ..... or a tin.



G. Harmful foods and other substances

Some foods can harm us. It is best not to eat them. In this lesson, we also learn about the dangers of drinking alcohol and smoking cigarettes.

SWEETS AND OILY FOOD

Sweets, cool drinks and chocolate are nice, but they are bad for teeth. They also make people too fat. Oily food makes people fat too. Very fat people are not healthy and often have *heart problems*.

DIRTY OR OLD FOOD

Never let flies or cockroaches sit on food. They carry germs. Dust also brings germs. Always cover food when you are not eating. After some time, food goes bad. It goes bad quickly in hot weather. Don't eat old food, you will get a *stomach-ache*.

POISONOUS FOOD

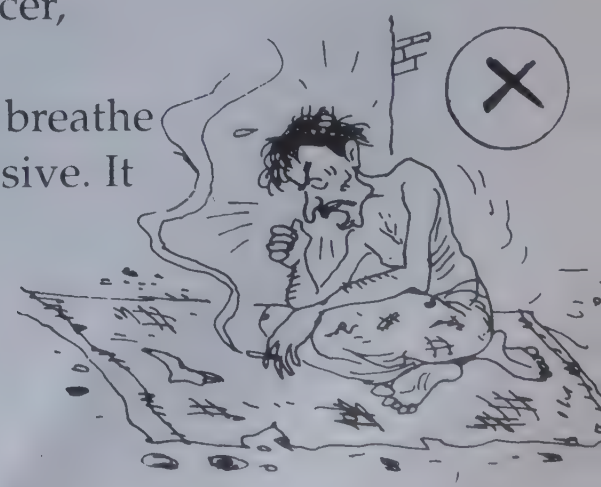
Some fruits and vegetables look good, but they are poisonous. Don't eat fruit from a tree if you don't know what it is. It might be *poisonous*. Sometimes farmers spray too much pesticide on plants. *Pesticides* kill animals and insects. They can also harm us. Always wash fruit and vegetables carefully before you eat them.

DRINKING ALCOHOL

Some drinks, like arrack and beer, contain *alcohol*. If people drink a little alcohol, they feel happy. Then they want to drink more. If they drink a lot of alcohol, they become drunk. They don't know what they are doing. They may hurt other people or themselves. If they drink a lot of alcohol for a long time, they become ill. They cannot work. They make their families unhappy. They often die.

SMOKING AND TAKING DRUGS

Smoking *cigarettes* is dangerous. People who smoke may get cancer, lung problems, heart problems and stomach ulcers. Every year thousands of people die because they smoke. Other people who breathe the smoke may also become ill. Cigarettes and alcohol are expensive. It is better to spend money on good food.



Some people take *drugs*. Drugs can make people feel happy for a short time, but they can kill. Never take drugs.

Answer these questions:

1. Why are too many sweets bad for you? (Give two reasons.)
2. What can carry germs onto food?
3. Does food go bad more quickly in summer or in winter?
4. Why should you never eat fruit from a tree you don't know?
5. What happens to people when they drink a little alcohol?
6. What happens to people when they drink a lot of alcohol?
7. What illnesses do smokers often get? (Name four.)

H. Water

You will need :

- several large sheets of paper stuck together,
- wax crayons, paint or other colours,
- one sheet of white paper for each child,
- scissors.

In this unit we will learn about the importance of water in our lives. About 7/10 of our body weight is water. We cannot live without it. We need to drink many times a day. All hot and cold drinks are made with water. When we drink, water goes into our blood. It comes out of our bodies in many ways—urine, sweat, tears and the water vapour from our mouths. If you breathe on a mirror, it goes misty. The mist is water vapour.

Make a frieze about water for your wall.

Work in groups of two or three children. Two groups can draw or paint the background on the big sheets of paper. Draw houses, trees, roads, fields etc. These two groups may also draw large sources of water on the background (e.g. rivers, canals, lakes, ponds).

The other groups will draw and colour pictures on the small pieces of paper. These pictures should be simple, so that you can cut them out and stick them on the background. Three or four groups can draw *sources of water* on small sheets of paper (e.g. wells, hand-pumps, motor pumps, large water tanks). Other groups can draw *uses of water* (e.g. people drinking, cooking, watering plants, fishing, bathing).

This frieze may take you several days. When it is finished, stick it on the wall of your classroom. If you work hard, it will look lovely.

I. Clean water

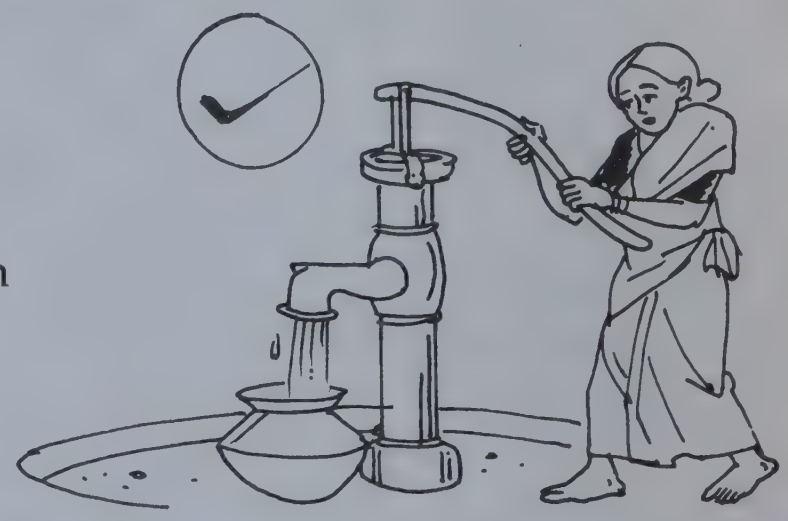
You will need :

* ten poster size sheets of paper,
* thick felt tip pens or crayons.

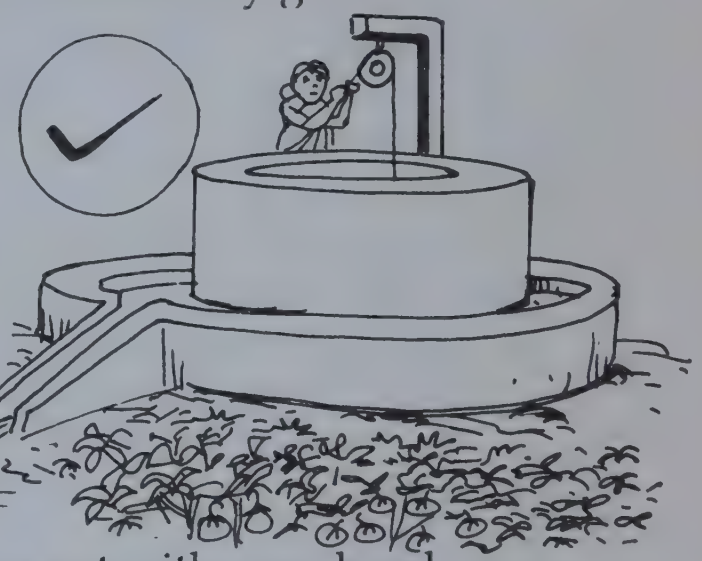
Every year thousands of people die because they drink dirty water.

There are many ways we can make sure our water is clean.

1. Make sure you get drinking water from a clean source. Don't drink water from ponds, rivers or canals. It is best to get it from pumps, taps or clean wells.



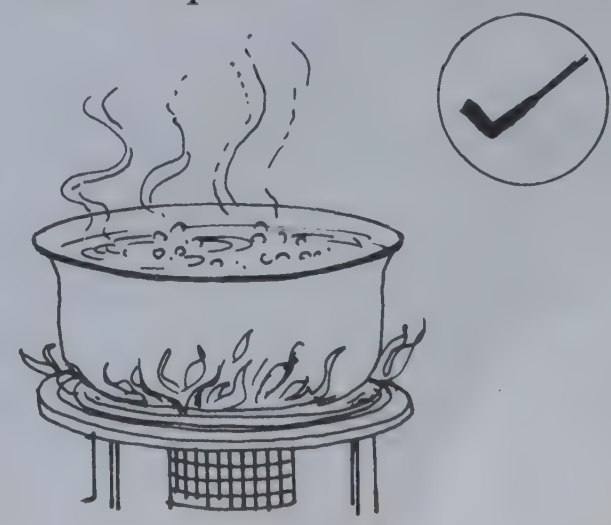
2. Clean your drinking water pots at least once a day. If you get water from a well, make sure that the bucket or pot is clean. Don't put it on muddy ground.



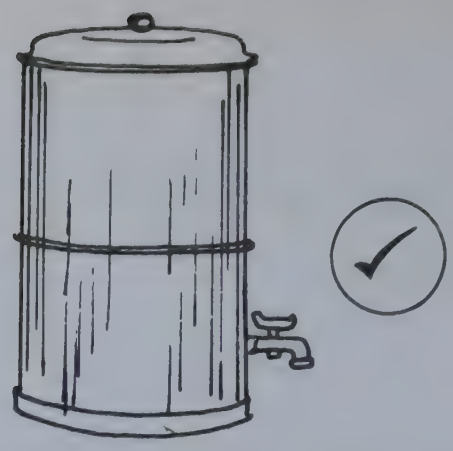
3. Make a cement platform beside wells and pumps, so that the nearby ground does not get muddy. Make a slope away from the well so that dirty water does not go back into the well. If you plant vegetables near the well or pump, slope the water towards your vegetables.

4. Never touch the water in a pot with your hand. Always take water out with a clean glass. Don't drink water and then take water from the pot with the same glass. If you do, you may give your germs to other people who drink from the pot.

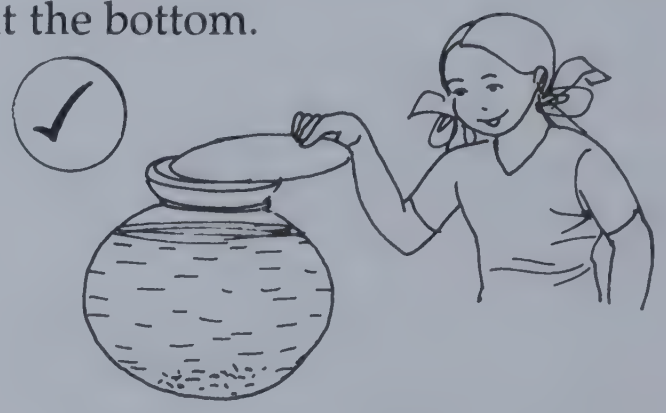
5. If you are not sure that your water is clean, boil it. If you boil water, you kill all the bad germs in it. It is not enough just to make it hot. You must make sure that big bubbles come from the water.



6. Use a water filter. This takes out the dirt. But it does not kill all the germs. Only boiling kills all germs.

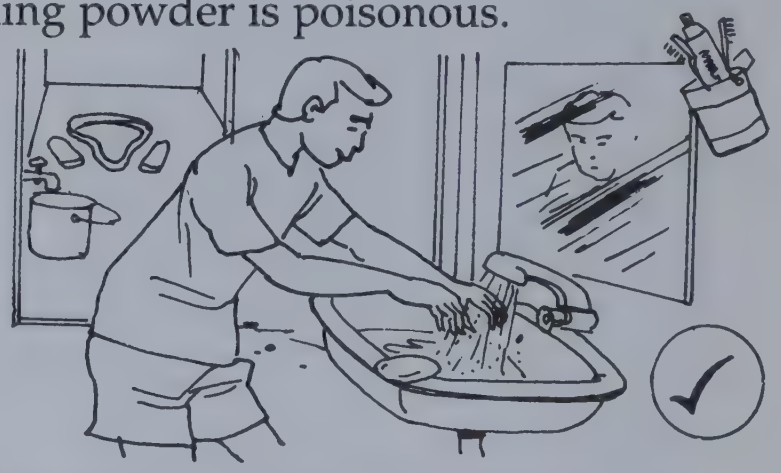


7. If you do not have a water filter use a pot. Pour water into it and, let the dirt collect at the bottom of the pot. Do not drink the water at the bottom.



8. Always cover your water pots. If you don't, germs may get into the water. Also, mosquitoes may lay their eggs on it.

9. If a water tank or well is dirty, you can add bleaching powder. This will kill the germs, but be careful to read the instructions carefully. Do not add too much. A lot of bleaching powder is poisonous.



10. Never go to the toilet near a well, pump or tap. Use a latrine if possible or go to the toilet away from houses. Always wash your hands with soap after you go to the toilet.

Making Posters

Teach the rest of the children in your school about the importance of clean water. Divide into ten groups. Each group should design a poster about one of the ten points you have learned. Make sure that the writing is big and clear. Write between ruled pencil lines to be sure that the writing is even. Leave plently of space between words. Draw a big colourful picture to illustrate your point. Display your posters on the walls of your school.

J. Polluted water

Polluted water is dirty water. Water can be polluted in many ways.

When there are no rains we have *droughts*. Then there is no water in our lakes, wells and pumps. Water does not come through taps. People have to carry water for long distances. In a drought, we must all save water and use it carefully. Sometimes there is

not enough clean water for washing things well. Then people get diseases, especially skin problems and diarrohea.

When there is too much rain, we have *floods*. Diseases spread in floods as well as in droughts. The water covers the ground and washes dirt from the drains into the streets. Dirty water gets into wells and pipes. Then people get diseases like cholera, typhoid, jaundice and diarrohea.

Water is polluted when people do not use *latrines*. They go to the toilet near streams, rivers or lakes. Then their germs go into the water and give other people diseases. It is very important to use latrines, especially in towns where people live closely together.

Sometimes water gets polluted by *factories*. The factories use water and put poisonous chemicals into it. This polluted water flows into our rivers and lakes. These poisonous chemicals can kill fish and animals which drink the water. They can also harm people. They can give us skin problems and diarrohea. People who live near some factories sometimes die because the factories pollute the water. There are laws to stop factories polluting water. We must make sure that the factory owners obey those laws.

Some factories let out dirty smoke. The smoke mixes up with the water vapour in the clouds. When the water vapour turns into rain, the rain is polluted with chemicals. This is called *acid rain*. Acid rain can kill trees and damage buildings. Factory owners can filter the chemicals out of smoke. Sadly, they often do not want to spend the money on the filters.

Answer these questions in complete sentences :

1. Why do people sometimes get diseases in times of drought?
2. Why do people sometimes get diseases when there is a lot of rain?
3. What happens if people go to the toilet near a river?
4. If you live in a town, where should you go to the toilet?
5. How do some factories pollute water?
6. How do some factories pollute rain?

Revision

I. Complete these sentences with suitable words (there may be many possible answers) :

1. Rice, ...and.....contain a lot of starch.
2. ..... and.....contain a lot of vitamins.
3. ..... and.....contain a lot of protein.
4. ..... protect us from diseases.
5. ..... helps us to grow well.
6. ..... gives us energy.
7. If you eat a little of these different kinds of food, you have a .....diet.

II. Answer these questions with short answers. Use the words given in the table.

Yes,	it is. you should. it does.

No,	it isn't. you shouldn't. it doesn't.

1. Should you throw away rice water?
2. Is oily food bad for you?
3. Does white rice contain more protein than brown rice?
4. Should you cook vegetables for a long time?
5. Does iodine make food with a lot of starch go blue?
6. Does dried food go bad quickly?
7. Should you heat meat again and again?
8. Is fermented food good for people with diarrhoea?
9. Is ice cream good for your teeth?
10. Does smoking harm your lungs and your heart?

III. What are the best ways of making sure you drink clean water? Talk about it in class. Then put these sentences into order. Start with the best. End with the worst.

Drink water straight from the tap or pump.
Drink filtered water.
Take water from the top of a pot.
Drink boiled water.
Drink boiled and filtered water.
Put bleaching powder in your drinking water.
Drink water straight from the river.

IV. Extension work

1. You find out that a factory is polluting the canal near your school.The water smells bad. Some buffaloes died after they went into the canal. People who touch the water get bad skin diseases. Write a letter to the newspaper to complain about the factory.
2. Design a simple latrine for a house with no running water. Describe how it will work and draw a diagram. Here are some ideas, but you do not have to use them.

* You could dig a deep hole and cover the waste every day. (How will you cover the waste? How will you make sure that the hole does not crumble at the sides?)
* You could make a drain to take water to a pit. (With what will you cover the pit ? What will you put in the bottom of the pit to make sure that the waste water drains away?)
* You could make a drain to water nearby fields. (How will you make sure that the water does not go across any roads? How will you make sure that the drain does not overflow when it rains?)

UNIT 5

Materials

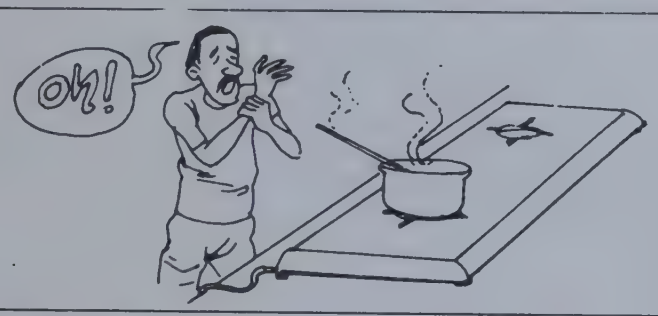
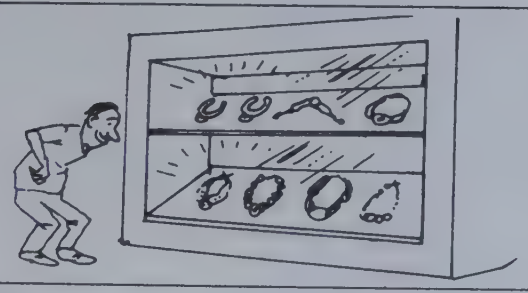
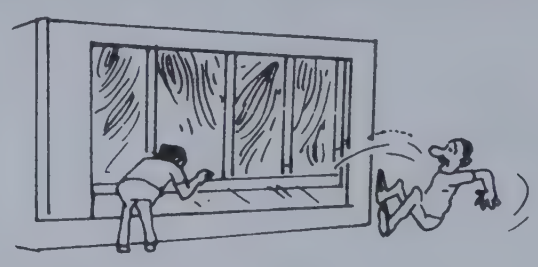
Key words

particle : a very small part of something	soluble : easily dissolved
property : a special quality of a substance e.g. *Hardness is a property of wood.*	solution : a liquid with something dissolved in it
	substance : a material

A. The properties of materials

Some materials are soft; some are hard. Some materials are rough; some are smooth. You can see through some materials; you cannot see through others. Some materials get hot quickly; some don't. Some are sticky, some are smelly, some break easily, some bend easily. We call these differences the *properties* of materials.

Which of these properties do the materials below have? Complete the sentences below each picture. The first is done for you.

1 	2
The metal spoon gets hot quickly.	The wooden spoon .....
3 	4 
The man can ..... through the glass window.	The man can't ..... the wooden shutters.
5	6
The arm-chair is	The stool is ..... .

7	8	9
The path is	The floor is	The flower is ..... .

B. Which keeps hot longest?

You will need :

- a variety of cups / tumblers made of glass, china, metal, plastic etc. roughly of the same size,
- a kettle of boiling water,
- if possible (but not essential) a thermometer.

Collect some cups, glasses and mugs of about the same size. Two of you try to arrange the cups in a line, in the order of which you think will stay hot longest.

Try to write and discuss with others on the following points:

1. the *material* each one is made of,
2. its *size* (small cups get cold more quickly than big ones),
3. its *shape* (cups with wide tops get cold quickly),
4. its *thickness* (thin cups get cold quickly).

Now pour some boiling water in each one.

Leave the cups for ten minutes. While you are waiting, write a table like the one below in your exercise books. Write 1 beside the cup you think will stay hot longest, 2 beside the second hottest and so on. Your list might look like this (but not exactly because the cups you use will be different) :

Cups used	***Guess***	***Observation***
red china mug	*2*	
small blue china cup	*6*	
white plastic cup	*4*	
small stainless steel cup	*5*	
big stainless steel cup	*3*	
glass tumbler	*1*	

After ten minutes, one careful person should feel the water in each cup and write the correct numbers in the *Observation Column* on the board. If you have a thermometer your results will be more accurate. You may have one other person to check, but only one person at a time, or the water may get spilt.

Answer these questions about the experiment you did with cups and glasses:

1. How many guesses did you get right?
   I got ..... guesses right.
2. Which cup or glass stayed hot longest?
   The ..... stayed hot longest.
3. Which cup or glass got coldest?
   The ..... got coldest.
4. Which usually stay hot longer—large or small cups?
   ..... stay hot longer.
5. Which do you think stay hot longer—thick cups or thin cups?
   I think ..... stay hot longer.

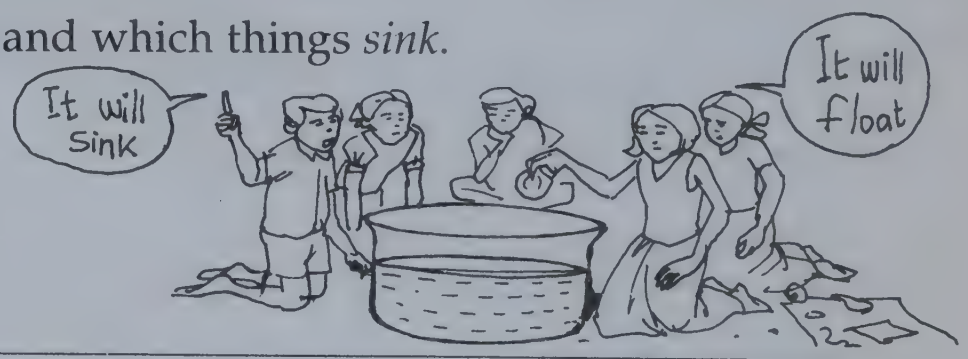
C. Which materials float?

You will need (for each group of four to six children) :

- a glass jar of water,
- a rubber band, a tomato, a piece of potato or other vegetable, a leaf, a scrap of paper, a bit of thread. (Use other materials if any of these are difficult to find.)

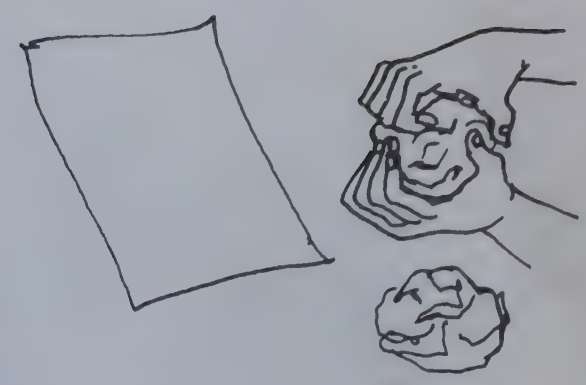
Get into groups to test which things *float* and which things *sink*.

First make your guesses. Amina made her guesses like this. Make a table like hers but remember that you do not have to guess the way she guessed!



objects to test	Guess	Observation
rubber band	*sink*	
potato	*float*	
leaf	*float*	
paper	*float*	
thread	*sink*	
tomato	*sink*	

When you have made your guesses, try each object in the water. Talk about your results in the class. Did each group get the same results? If not, why were they different? Crush the paper, thread and leaf into little balls and then see what happens. Does this change the results? If so, why?



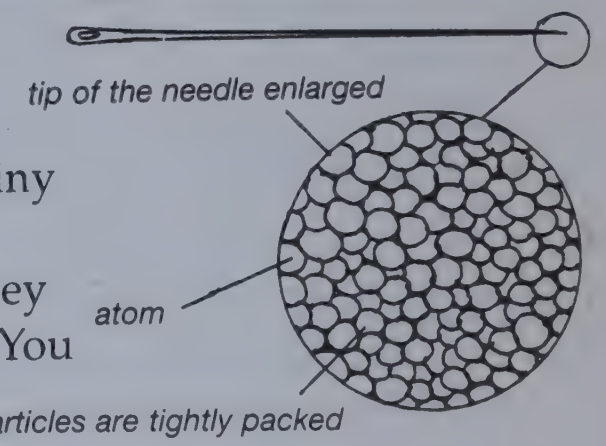
Write your observations beside your guesses in the table. For example, Amina wrote beside rubber band: *Four rubber bands sank and three floated. The rubber bands which sank were made of a different material from the others.*

Write some sentences about the experiment, following this pattern (and add some of your own ideas if you can).

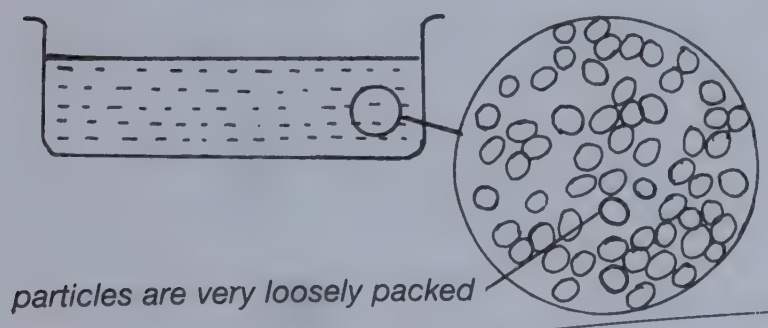
1. The rubber band 2. The potato 3. The leaf 4. The flat paper 5. The ball of paper 6. The thread 7. The tomato	floated sank	because it	was light. was flat. did not soak in water. was heavy. was not flat. soaked in water.

D. Particles

Scientists think that everything in the world is made of tiny particles called *atoms*. The particles are too small to see. Particles in a *solid* are packed tightly together. Because they are squashed together, a solid can have a definite shape. You cannot put your fingers through it.



This is a picture of a part of the tip of a needle which is enlarged several thousand times. Each tiny particle is called an atom.

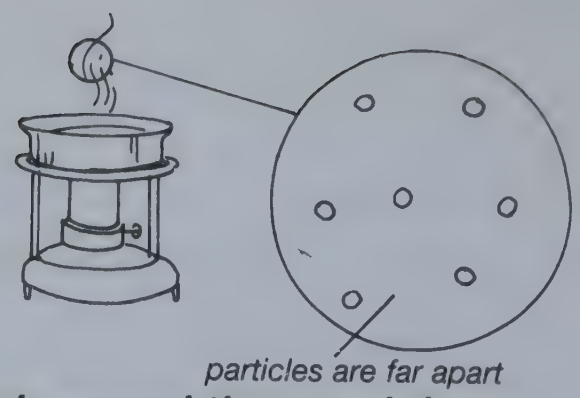


Particles in a *liquid* are not so close together, but keep near each other. Because they are not squashed together, you can put your fingers through a liquid. The liquid takes the shape of the vessel it is in.

Did you know ?

A grain of sugar is made up of about 5 00 00 00 00 00 00 00 00 000 particles and each rain drop is made up of about 1 00 00 00 00 00 00 00 00 00 000 particles.

Particles in a *gas* spread out a long way from each other. This is why a gas has no shape. It is often difficult to see a gas because the particles are so far apart.



Imagine you have a microscope which can make things look several thousand times bigger than they are. Draw the particles in

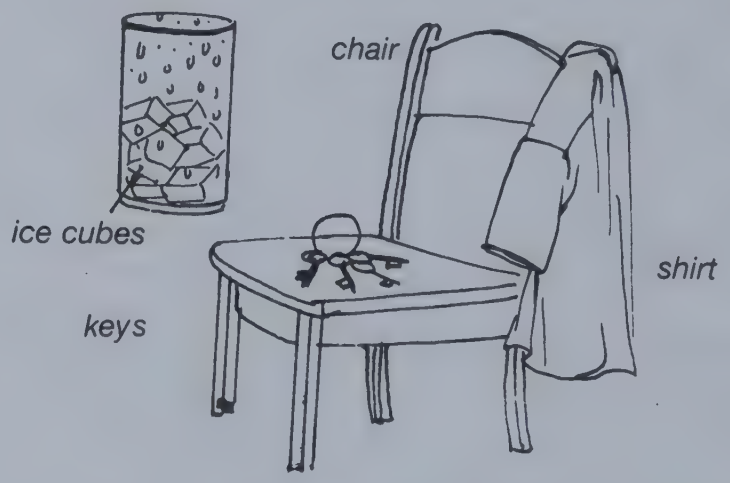
a) a cup of tea b) your breath c) your pencil

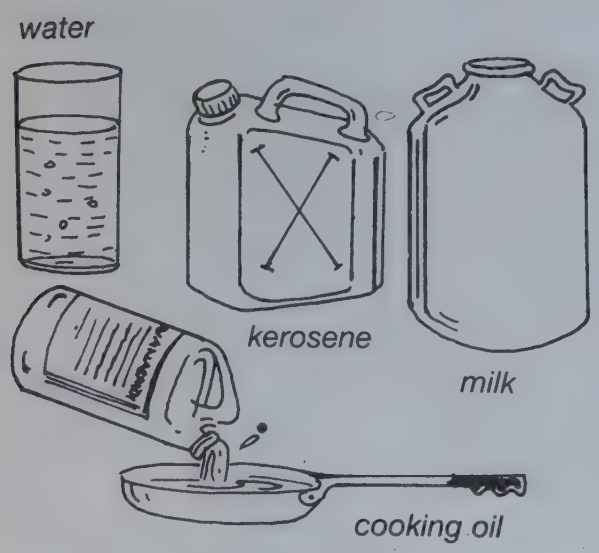
E. Water, ice and steam

You will need :

- some different sized cups of water,
- if possible, bring some ice cubes in one thermos and some hot water in another thermos.

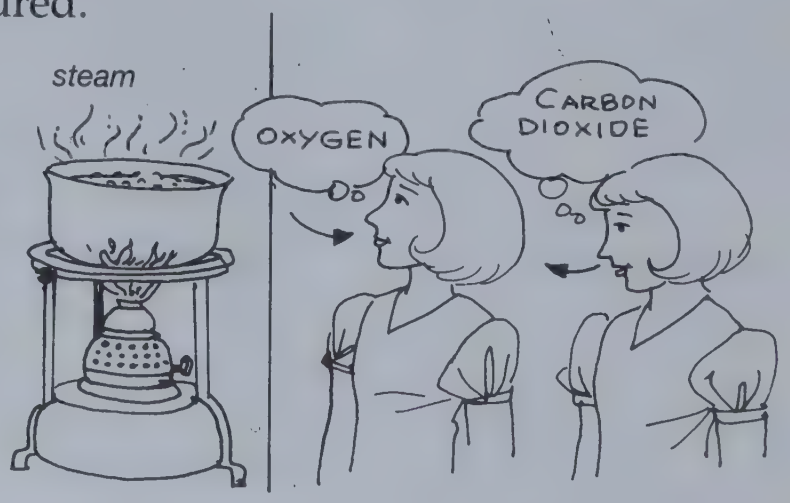
Think of some ice in a glass. The ice does not fill the shape of the glass. There are spaces between the pieces of ice. Each piece is hard. You can pick it up. It is a solid. Some other solids are wood, metal and cloth.





Pour some water from one cup into another. The water takes the shape of the cup. It pours easily. It is a liquid. Some other liquids are milk, kerosene and oil. You can pour them. They take the shape of the containers in which they are poured.

Think of steam rising from a hot pan of water. You cannot pour it into a glass—it is not a liquid. You cannot pick it up—it is not a solid. It spreads all round the room. It is a gas. Some other gases are oxygen and carbon dioxide.



When we boil water, it turns into steam. Steam is a gas.
When we make water very cold, it turns into ice. Ice is a solid.
Water can be solid, liquid and gas.

Did you know ?

Any solid can be changed to a liquids or gas, if it is made hot enough. There in probably iron gas in the sun !

Choose the words which make best sense.

1. Water is a | solid | liquid | gas | . You | can | cannot | pour it easily.
   It | does | does not | take the shape of its container.
2. Ice is a | solid | liquid | gas | . It is | soft | hard | runny | .
   It | does | does not | take the shape of its container.
3. Steam is a | solid | liquid | gas | . You | can | cannot | pour it easily.
   It | spreads | does not spread | all round a room.

F. Evaporation and condensation

You will need:

* a large spoon of salt,
* a pan of very hot water and a lid (a thermos flask of boiling water will do if you cannot get hot water at school).

Look at some very hot water. Look at the steam coming from it. When water gets hot, it *evaporates* or turns into steam. It becomes a gas.

Put a lid or saucer over the steam. You should see small drops of water on the saucer. The steam has condensed because it has met the cold lid. When steam becomes cold, it *condenses* or turns into water again. It becomes a liquid.

Put some salt in the water. Stir it well. Taste the water to check that it is salty. Boil it and taste the water that has condensed on the lid. Find out if the condensed water is salty.

Match these sentences to the correct endings:

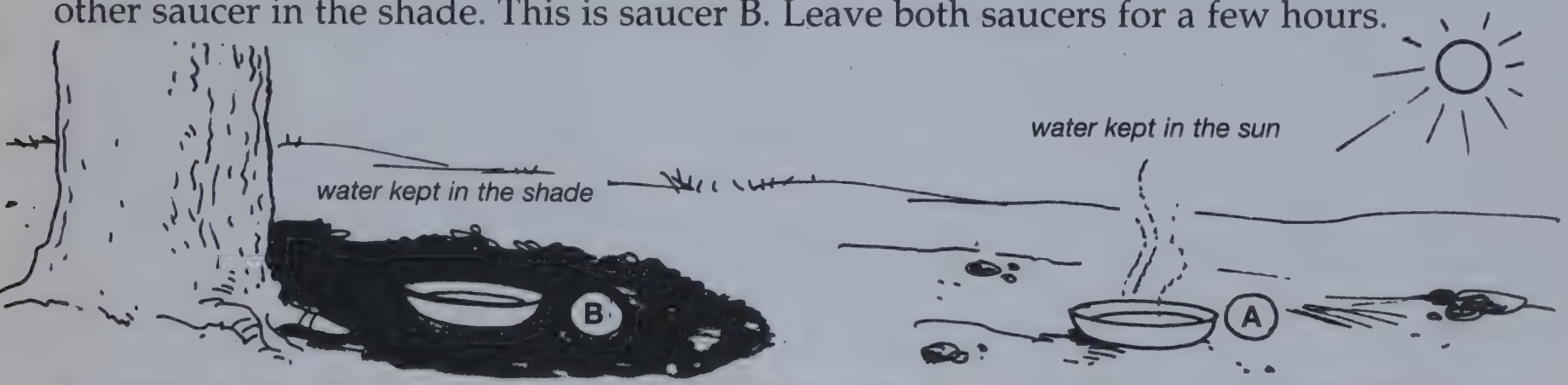
1. When you make water hot, it	tastes salty.
2. When you make steam cold, it	does not taste salty.
3. If you put salt in water, the water	condenses.
4. Steam from salty water	evaporates.

G. An experiment with evaporation

You will need:

* two saucers and a little water.

Do this experiment to find out more about evaporation. Put a teaspoonful of water in two saucers. Put one saucer in the sun. This is saucer A. Put it in a place where people will not knock it over and where dogs will not drink it. With the same care, put the other saucer in the shade. This is saucer B. Leave both saucers for a few hours.



1. ***Write two sentences about what you think will happen. Choose two possibilities from table given below:***

I think the water in	saucer A saucer B	will boil. will disappear. will go down. will not change.

2. ***Look at your saucers after a few hours. Make two sensible sentences from this table:***

The water in saucer A The water in saucer B	boiled. disappeared. went down. did not change.

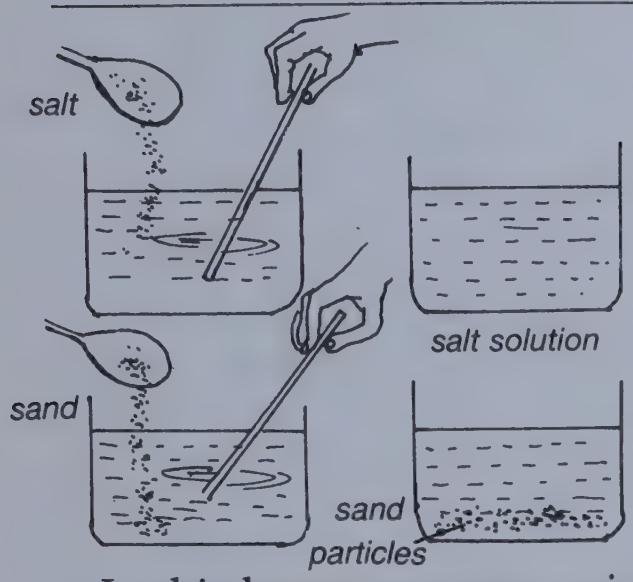
3. ***Which evaporated more quickly — the water in saucer A or the water in saucer B?***

H. Soluble materials

You will need:

- 10 jars of water,
- a teaspoon of : instant coffee powder, ground coffee, tea powder, salt, washing powder (detergent), a scrape of candle wax, jeera powder, haldi powder, sugar and (if possible) oil-based paint,
- 20 spoons,
- an old piece of thin cloth, a bucket,

Don't worry if you can't get all of these things. You can always try other materials.



When substances are *soluble,* they dissolve easily in some liquids. For example, if you put salt in water, it mixes up with the water and become a part of it. This mixture is called a *solution.* A solution will go through a cloth filter.

When substances are not soluble, they do not dissolve. For example, if you put sand in water, you can see that the particles of sand do not mix—even if the particles are very small. Insoluble substances will not go through a cloth filter.

In this lesson, you are going to do two tests to find out which substances are soluble in water.

First look at the list of the given materials. Then write what you think will happen when they are put in water (will dissolve or won't dissolve). Fill in the guess column of your table.

Materials	guess	result
instant coffee powder *ground coffee* *tea powder* *salt* *washing powder (detergent)* *a scrape of candle wax* *jeera powder* *haldi powder* *sugar*	*will dissolve*	

Get into groups of two or three. Each group can test a different substance in a jar of water. Stir it well with a spoon for up to five minutes. Look carefully at the water. If there are no tiny bits, the substance has dissolved. You have made a solution. If there are tiny bits and it seems thicker at the bottom of the jar, the substance has not dissolved. You have not made a solution.

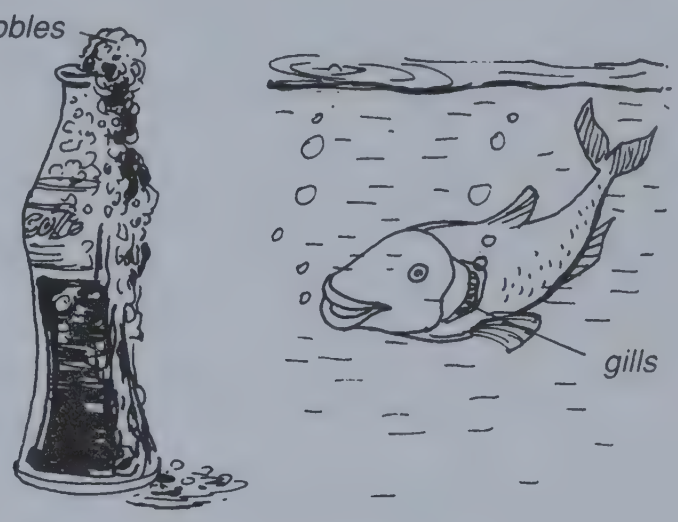
Check your result. Pour the mixture through a cloth into a bucket. If there are tiny bits in the cloth, you have not made a solution.

Each group should report their result to the class. Discuss your results. For example, would some things dissolve more quickly if the water was hot? Write what happened to each substance (dissolved or didn't dissolve) in the results column of your table.

I. Dissolving liquids and gases

We have learned how to make solutions by mixing some solids and liquids. We can also make solutions by mixing two liquids. For example, we can make a solution with water and lime juice. We can make a solution with tea and milk too. Oil and water do not make a solution because oil does not mix up with water.

We can also make solutions by mixing a liquid and a gas. If you look at a fizzy cool drink, you will see little bubbles. These are bubbles of carbon dioxide. When we boil water, bubbles of air come out of the water. So we know that air is dissolved in water. Fish can breathe the air in water. They have gills at the back of their heads. These take the oxygen out of the water.



Draw and label:

a) a commonly used solution of two different liquids
b) a commonly used solution of liquid and a gas.

Revision

I. Match the two halves of these sentences:

1. Particles	have very tightly packed particles.
2. Solids	are what make it special.
3. Liquids	have particles a long way apart.
4. Gases	will dissolve easily.
5. The properties of a material	have loosely packed particles.
6. Soluble substances	are very tiny parts of something.

II. Write down at least two properties of the following materials. The first is done for you.

1. glass : Glass is hard, smooth and you can see through it.
2. a brick: .....
3. water : .....
4. mango pickle : .....
5. a leaf : .....
6. gold : .....

III. Which of the following will make a solution? Put a tick or a cross beside each pair.

1. sugar and water ☐ 2. sand and water ☐ 3. oil paint and water ☐
4. instant coffee and milk ☐ 5. haldi and water ☐ 6. water and milk ☐

IV. Extension work

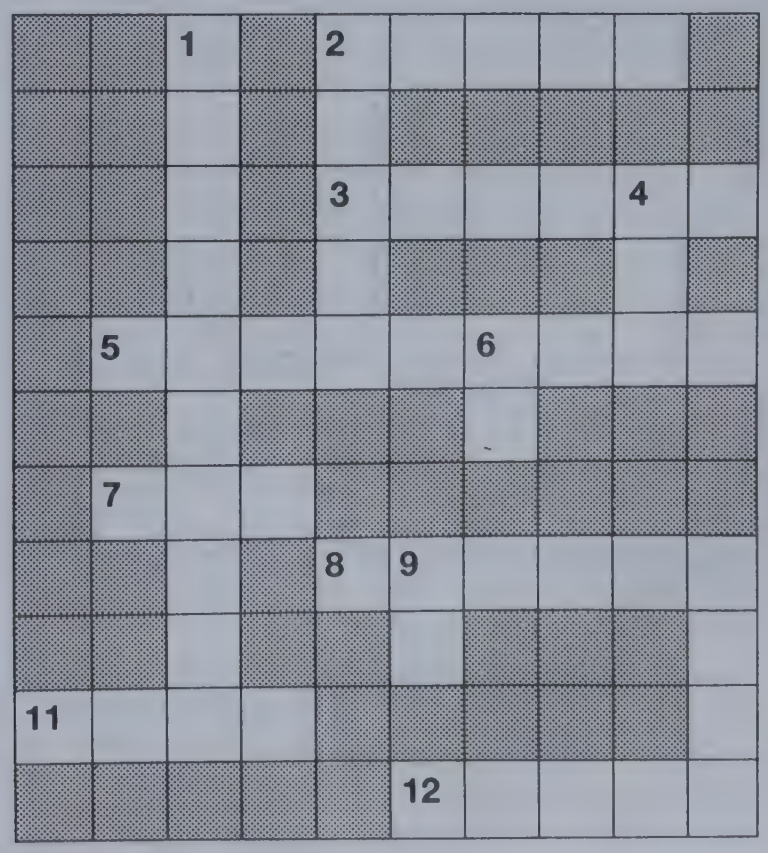
Complete this crossword:

Clues across:

2. Boiling water turns into a gas called .....
3. Water is a ..... . So are milk, kerosene and tea.
5. When water vapour turns back into a liquid, we say that it .....
7. Water vapour is a ..... . It can spread all around a room.
8. We can make dirty water cleaner if we put it through a water ..... .
11. We ..... ourselves in water to make our bodies clean.
12. It is very important to drink ..... water.

Clues down:

1. When water turns into a gas, we say that it ..... .
2. Ice is a ..... So are stone, wood and plastic.
4. Frozen water is called .....
6. There is ..... salt in water vapour.
9. We swim ..... water.
10. ..... falls from clouds when they get cold.



UNIT 6

Soil, Rocks and Crops

Key words

crop rotation: changing the crop on a field so that the soil does not become weak

fertile: good for growing plants

humus: rotted plants and animal matter in the soil

intercropping: growing different plants together so that no pesticides or artificial fertilisers are needed

irrigate: to put water on your land so that crops grow well

Loam soil: soil from the garden which is good for growing crops; it has a lot of humus

terraced land: a flat field cut into the side of a hill—the farmer makes steps in the land and a little wall at the edge of each field so that the water does not run away down the hill

A. Soil and rocks in our lives

You will need:

* some sand, some loam or garden soil, some clay, some stones (a handful for each group of children),
* a jar of water for each group,
* if possible, some magnifying glasses.

crumbling the soil *rubbing two stones* *making clay balls* *putting some loam soil in water*

There are many different kinds of soil and rock. In groups, look carefully at some stones, some *loam soil*, some *sand* and some *clay*. Break up the loam soil and clay with your fingers. Look carefully at the particles, if possible with a magnifying glass.

In your groups, talk about these questions:

1. Which breaks up in your fingers more easily—loam soil or clay?
2. Look carefully at the particles. Use a magnifying glass if you have one. Which has bigger particles—loam soil or clay?

3. Which has the biggest particles—loam soil, clay or sand?
4. Rub two stones together. Can you make a little dust?
5. Look at the loam soil. Can you see any old bits of leaf, grass or seed? Are there any dead insects in it?
6. Put some loam soil into your jar of water. Does it all sink to the bottom or does anything float on the top?
7. Which pours most freely through your fingers—sand or clay?
8. With a few drops of water, try to make a marble-sized ball with some clay, some loam soil and some sand. Which makes the roundest and smoothest ball?

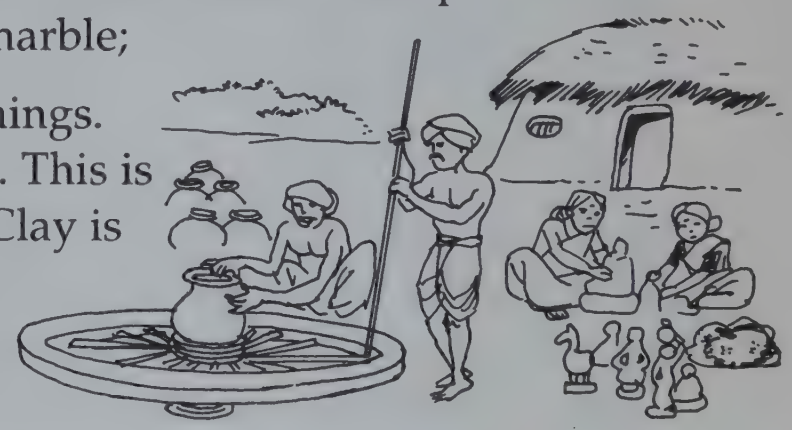
When you have finished the experiment and washed your hands, write the answers to the questions in your books.

B. Thinking about the experiment

Experiments don't always turn out as you expect! But you will probably find that:

* loam soil breaks up more easily than clay;
* the particles of sand are the biggest and the particles of clay are the smallest;
* by rubbing two stones together you can make a little dust;
* there are little bits of old leaf, grass, seeds and dead insects in the loam soil;
* the sand pours more freely through your fingers than clay or loam soil;
* some small bits floated to the top of the water some loam soil was put into it;
* the clay makes the roundest and smoothest marble;

Different kinds of soil are useful for different things. Clay has small particles, so it sticks together well. This is why we use clay to make pots and clay models. Clay is also used for making bricks. When you bake it, it becomes very strong.



Sand has big particles. It doesn't stick together, so water drains through it quickly. This is why we put sand on muddy paths. We also mix sand with cement to make concrete. The big particles pour freely and mix easily with the cement powder.

Loam soil has bits of dead animals and plants in it. This is called *humus*. The humus in the soil floated to the top of your jar. Humus makes the soil *fertile*. It is good for growing crops. *Manure* gives humus to the soil.

Most soils are a mixture of sand, clay, loam soil and stones. Some have more clay than others, some have more sand than others. Certain crops, like water melons, grow best in sandy soil. Other crops, like rice, grow best in clayey soil.

The best soil for crops contains rotten vegetable and animal matter. But most of the soil is made of dust. This dust comes from stones. Wind, rain and river water rub the stones against each other. The rubbing makes dust and the dust becomes soil.

Fill in the blanks with words from the box.

concrete	humus	crops	rub	mixes
stones	sticks	fertile	soil	pots

Clay is useful for making ..... because it ..... together well. Sand is useful for making ..... because it ..... easily with cement powder. Loam soil is useful for growing ..... because it has ..... in it. Humus makes the soil ..... . Different kinds of crops grow best in different kinds of ..... The dust in soil comes from ..... which ..... against each other.

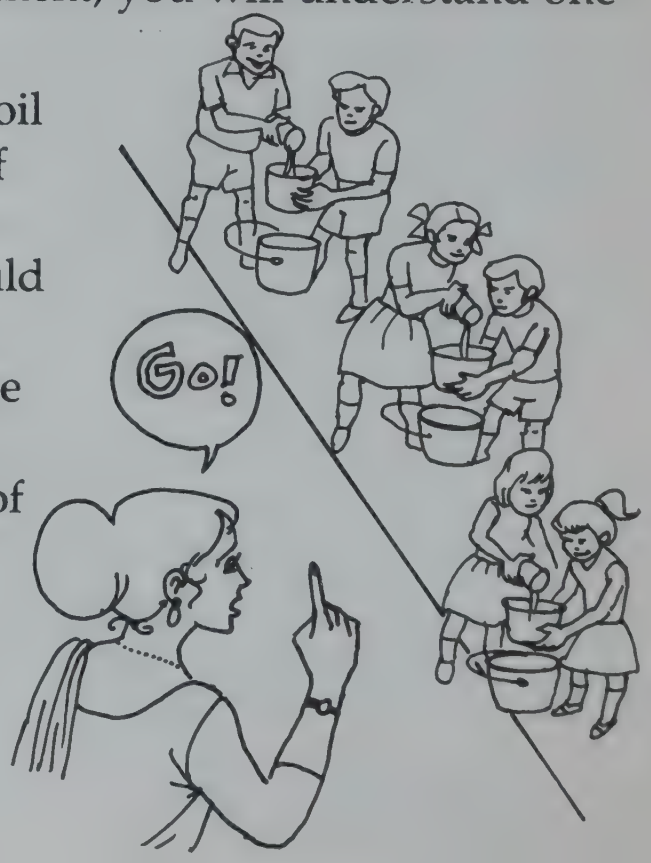
C. Which soil drains best?

You will need:

- three flower pots or tins with holes in the bottom,
- three identical large glasses of water,
- sand, loam soil and clay,
- three buckets.

In Unit 2, you did an experiment with soils. You probably found that your plants grew best in the garden soil (loam soil). You also learned that plants need the right amount of water—not too much and not too little. In this experiment, you will understand one of the reason why the plants in loam soil grew best.

Fill one flower pot (or tin) with sand, one with loam soil and one with clay. Leave at least 2 cm space at the top of the pot. Press down the loam, clay and sand well. Three children should come to the front of the class. Each should hold one of the pots over a bucket. Three more children should come to the front. Each of them should get a large glass of water. Make sure that each glass contains the same amount of water—so that you do a fair test. Each of these children should stand beside one of the children with a pot. When the teacher says, "Go!" they should pour their glasses of water into the pot beside them.



Write three sentences about each kind of soil, using the tables:

The water drained	fast quite fast slowly	through the	clay. sand. loam soil.

This is because	there is a lot of space between there isn't much space between there is some space between	the particles of	clay. sand. loam.

So plants in	sand loam soil clay	usually get	too much water. too little water. just the right amount.

D. Looking after the soil

We have learned about the importance of looking after the soil. We need to put rotted plants and dung on it. This is called *manure*. Manure helps to keep the soil good for growing crops.

We use pesticides to kill the insects and animals which eat the crops. But we must be careful about using pesticides as they can poison the soil after a few years. They kill other harmless creatures too. We must also be careful with artificial fertilisers. They make the soil better for a few years, but they can take away the natural goodness of the soil if we use them too much.

It is best not to grow the same crop in one field all the time. Different crops use up different chemicals in the soil. They also put different chemicals into the soil. So we should change the kind of crops we grow every year. Changing the crop is called crop rotation. For example, farmers often plant a wheat crop after a groundnut crop.

We can also grow many different plants side by side. This is called intercropping. The different plants fertilise the soil, so that no pesticides or artificial fertilisers are needed. This method is best for the soil. For example, some farmers grow gram along with wheat.

Intercropping

We should plant plenty of trees because the roots of trees hold down the soil. They stop the rain from washing the soil away. They also stop the wind from blowing it away.

Find out the answers to the following questions. You may ask your parents, teachers or friends. It will be even better if you ask a farmer, gardener or park keeper.

1. What kind of soil is there near where you live? Is it sandy, clayey or loam? (If you live in a city, you can look at the soil in a nearby park.)
2. What colour is it? Is it reddish, brown or black?
3. Which of the following plants grow best in this soil?
   rice, cotton, ragi, wheat, tomatoes, carrots, groundnuts, brinjals, potatoes, jowar
4. Which of the plants above do not grow well in it?
5. Do the farmers or gardeners use any fertiliser or pesticide? What kinds?
6. Where do they get their manure from?

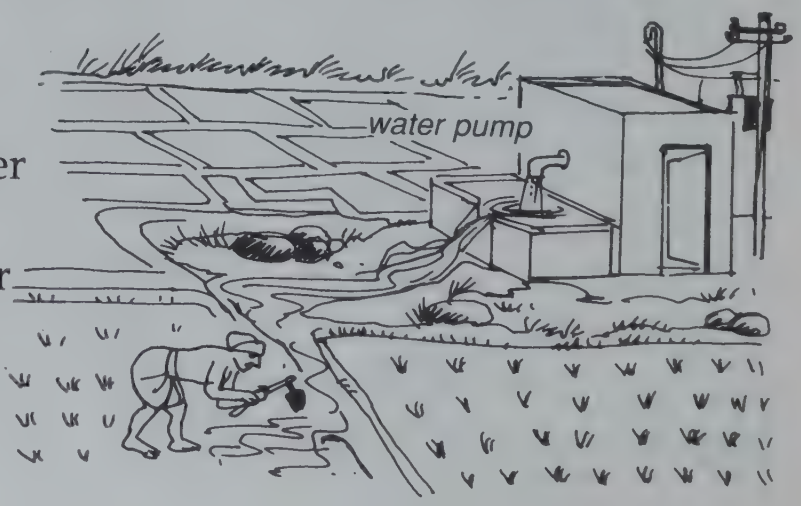
E. Irrigation

We must make sure that the soil gets enough water. If we don't, no crops will grow. People who have *dry land* have to wait for the rain. They usually grow only one crop a year—during the monsoon. Crops like dal, ragi and jowar can grow on dry land. Dry land is often hilly, because the water runs away down the hill. If the rain does not come, the farmers are unlucky and they get no crop.

Terraced land

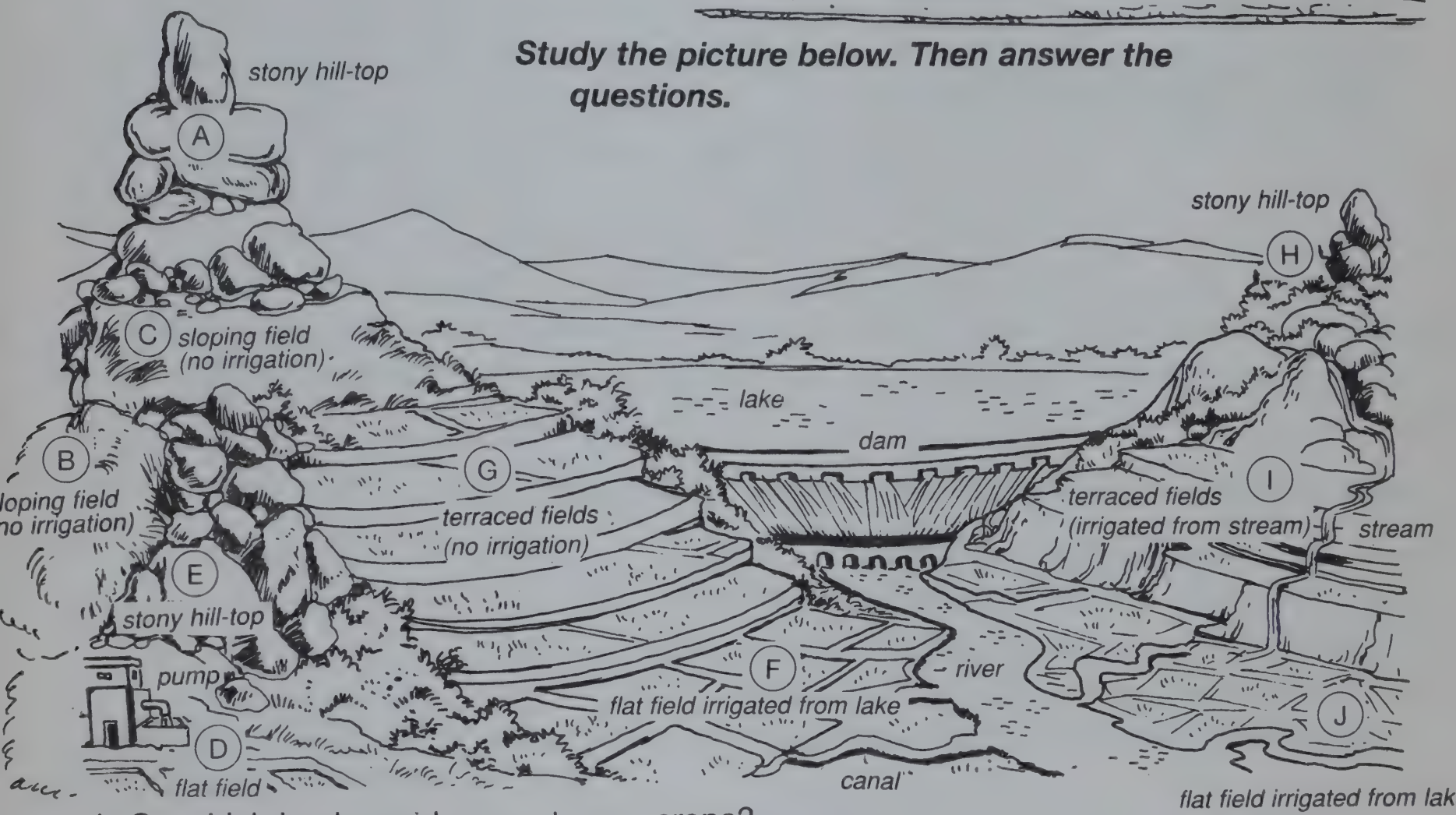
Some farmers have *wet land*. Farmers with wet land can *irrigate* their land. When they irrigate it, they put water on it. They do not have to wait for the rain. Rice must grow in standing water, so it is always grown in land which can be irrigated well. The land must also be flat so that the water does not run away. Farmers with hilly land must *terrace* their land if they want to irrigate it. Terraces are wide steps cut into the hillside. Farmers with a lot of water can sometimes grow two or three crops a year if the soil is good.

Some farmers irrigate their land from tube wells. The tube wells pump water up from under the ground. Then the farmers dig channels to make sure that the water gets to all parts of their fields. Farmers who do not have pumps have to buy water from people who do have pumps.



Some farmers irrigate their land from canals or lakes. They dig channels from the canal or lake to their fields. Different farmers have to share the water from one canal. Sometimes they quarrel about the water!

Study the picture below. Then answer the questions.



1. On which land would you not grow crops?
2. Which are the wet land fields? (Write the letter numbers.)
3. Which are the dry land fields?
4. Would you get more crops in a year from field I or field J? Give a reason for your answer.
5. Would you get better crops from field I or field G? Give a reason for your answer.
6. Would you get better crops from field G or field B? Give a reason for your answer.
7. Put the fields in order. The first is done for you:

no good for growing crops	A, E, H
not very good land	
fairly good land	
good land	
very good land	

F. Crops

You will need:

- a piece of white paper for each child
- if possible, some real fruits, vegetables and cereal crops,
- scissors, coloured pencils or crayons,
- three or four large sheets of paper
- some paste (or boiled rice).

Farmers have to gather their crops carefully. They must gather the crop at the right time—when it is ripe. They often gather fruit and vegetables just before they are ripe so that they do not go bad on the way to market. They must not drop the fruit while picking it, if they do, it will go rotten quickly. They must not let the crop get wet or it will get spoilt.

Farmers do not use their crops all at once. They must store their crops carefully. Firstly, they must keep all crops dry. They must keep crops away from animals and insects. They must get fresh fruit and vegetables to the market quickly—before they go bad.

Prepare a picture chart on fruits, vegetables and cereal crops.

Draw the pictures of fruits, vegetables and cereal crops. Colour the pictures neatly and cut them out.

Take three large sheets and label them fruits, vegetable and cereal crops respectively. Stick the pictures under the right labels and put them up on the wall.

Revision

I. Begin these sentences with Sand, Clay or Loam soil.

1. ..... pours freely.
2. ..... has very small particles.
3. ..... is mixed with cement to make concrete.
4. ..... has a lot of humus in it.
5. ..... is usually the most fertile soil.
6. ..... sticks together well so it is used for making bricks.
7. ..... has very large particles.
8. ..... does not let water drain through.
9. ..... lets water drain through, but not too fast.

II. There are ten words or phrases about rocks, soil and crops hidden in this wordsearch. How many can you find?

G	C	L	A	Y	Q	A	T	B
P	R	O	C	K	E	S	S	X
S	0	J	A	W	Y	A	N	B
O	P	M	V	C	M	Y	T	L
I	R	R	I	G	A	T	E	E
L	O	N	D	E	C	F	R	H
L	T	I	P	C	M	R	R	U
S	A	N	D	H	L	O	A	M
S	T	O	N	E	T	E	C	U
O	I	M	A	N	U	R	E	S
U	O	L	Q	P	Z	M	S	J
I	N	V	Y	O	E	D	H	L

III. Are these good ways to look after the soil? Copy the true sentences. Change the sentences which are not true.

* We can put as much pesticide as we like on a field.
* Rotting plant and animal waste is good for the soil.
* We should always grow the same crop in one field.
* It is good to make terraces on the sides of hills so that the water does not flow away.
* The roots of trees stop soil from washing away in the rain.
* All plants need the same amount of water.

IV. Extension work

Make a collection of different kinds of rock. Display them in your classroom. Try to find out what kind of rock they are, (e.g. granite, quartz, sandstone, mica etc.) Label each one with its name and where it came from.

UNIT 7

The Earth in Space

Key words

astronomy : the study of the planets, stars and space
constellation : a group of a few stars which seem to make a pattern e.g. *The Big Dipper* or *Saptarishi*
galaxy : group of millions of stars
gravity : the force that pulls things down to earth
one million : ten lakhs
orbit : to circle round something once
phases of the moon : the changes in the moon's shape over a month
planet : a ball-shaped body which goes round the sun
satellite : anything which goes round a planet
Solar System : sun and its planets
telescope : a very powerful magnifying glass which helps us to look into space
tipped : leaning at an angle

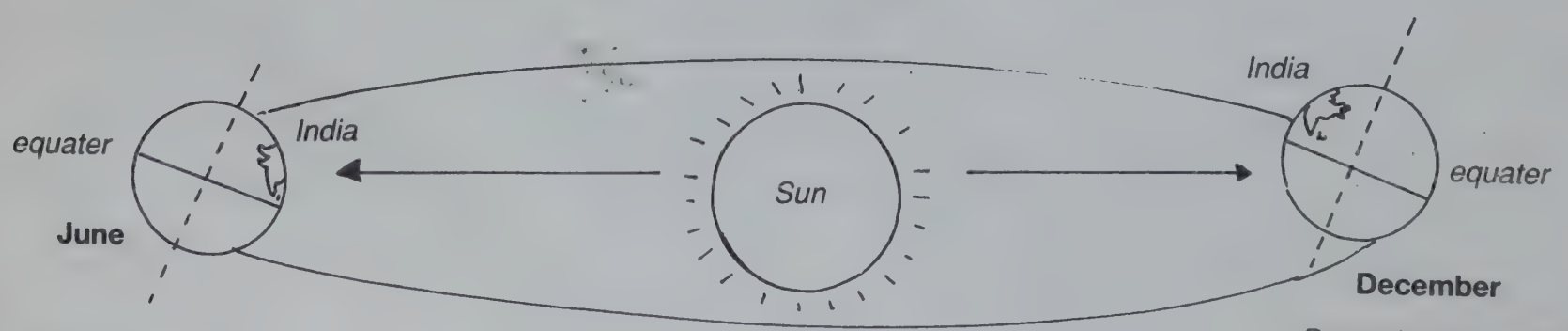
A. Revision

In Class 3, we learned about the earth and the sun. Let's revise what we learned. The sun is the star nearest to the earth. It is an enormous ball of fire, much much bigger than the earth. The earth is 93 million miles (150 million kilometres) away from the sun. The sun looks quite small to us because it is so far away.

The earth is like a round top which spins on its axis. It spins round every twenty-four hours. The sun can only shine on one side of the earth at a time. It is day for the side of the earth facing the sun. The side away from the sun is dark, because the sun's light cannot reach it. So it has night. As the world turns away from the sunlight, the sun seems to set.

The earth tipped on its axis

We have also learned that the earth goes round the sun every year. The earth's axis is tipped. So the northern half of the world is hotter in June because it is tipped towards the sun. The northern half of the world is colder in December because it is tipped away from the sun. India is in the northern half of the world. So we have summer from April to September and winter from October to March.



June is usually hot because India gets strong sunlight

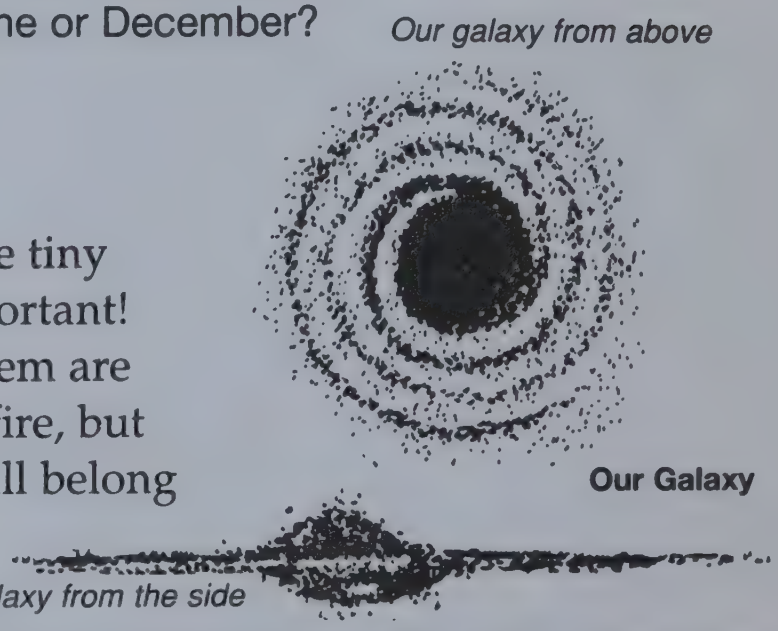
December is usually cold because India gets less sunlight than in June.

Answer these questions.

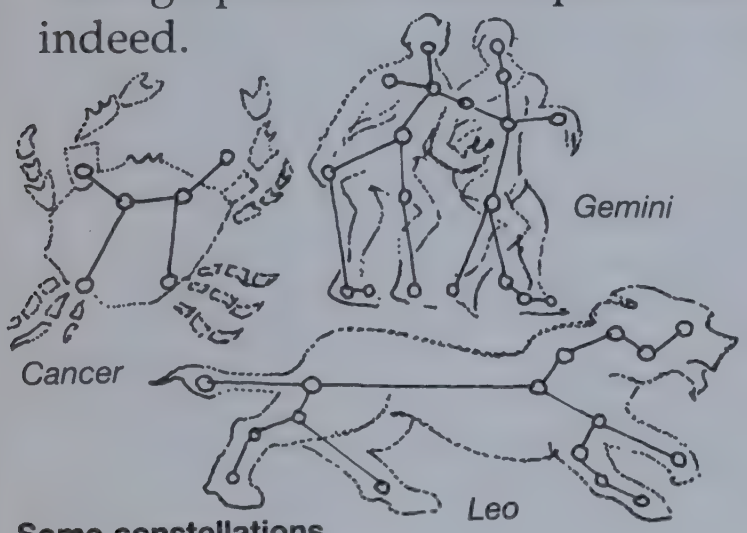
1. What is the sun?
2. Why does the sun look so small?
3. How long does it take the earth to spin on its axis?
4. When our side of the earth faces the sun, do we have day or night?
5. How long does it take the earth to go round the sun?
6. Is the northern half of the world hotter in June or December?
7. Is the southern half of the world hotter in June or December?

B. The stars

We can only see the stars at night time. They are tiny little dots of light and they don't look very important! But in fact, the stars are like the sun. Most of them are bigger than the sun. Each star is a huge ball of fire, but so far away that it looks tiny. The stars we see all belong to a great group of stars called a *galaxy*.



There are millions of stars in a galaxy. Our galaxy is called the *Milky Way*. There are lots of other galaxies in space but they are very far away. We can only see them through powerful telescopes. Beside the galaxies, our little world seems very small indeed.

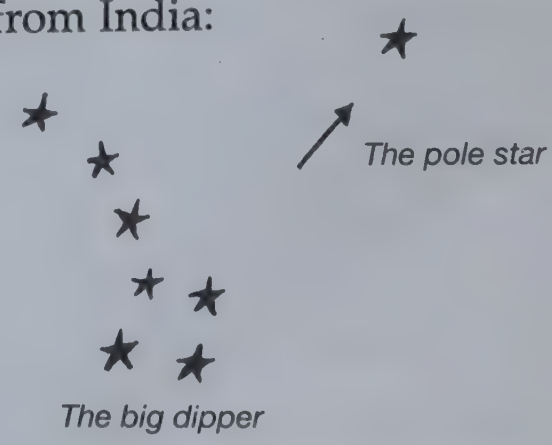


Some constellations

The stars do not move about. They stay in the same place.

Sometimes the brighter stars seem to make patterns from where we see them. People have given names to these patterns. We call the patterns *constellations*. Here are some common constellations which we can see from India:

The *Big Dipper* looks rather like a cup with a handle to dip into a water jug. Look at the two stars furthest from the handle. They point north to the *Pole Star.* At night, sailors use the Pole Star to show them where north is. *Orion* is easy to pick out because it has three stars in a line. *Cassiopeia* looks like a big W.



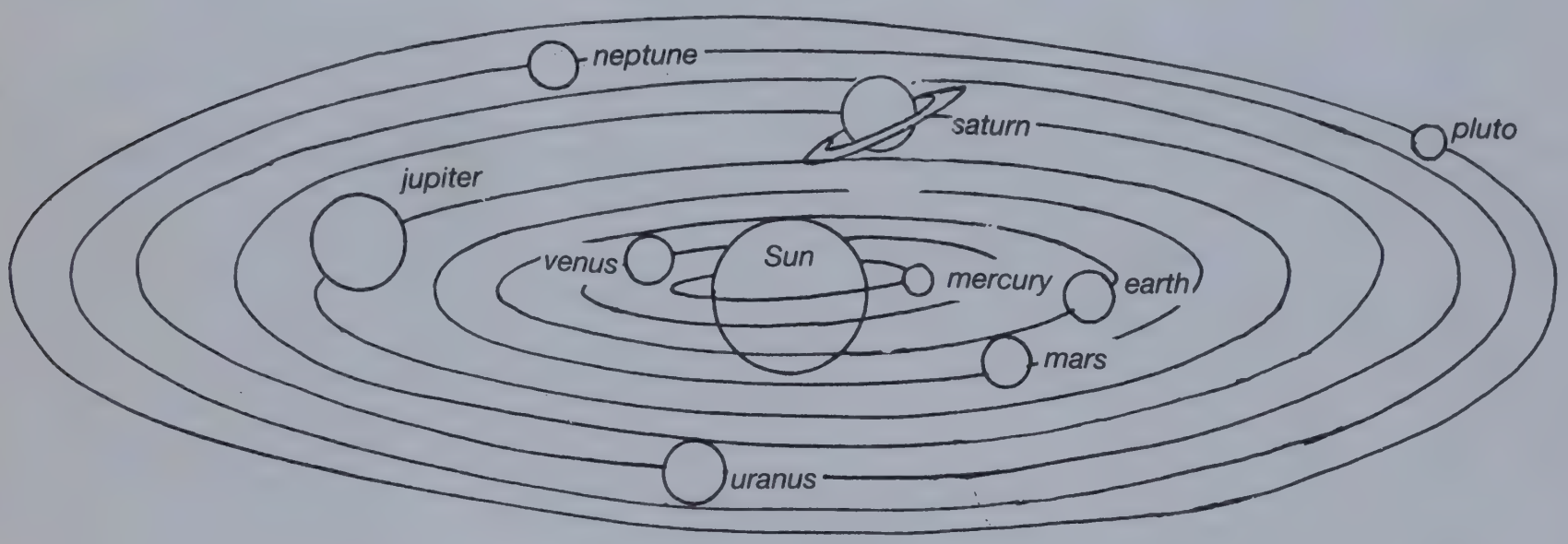
The stars are there all the time—day and night. But in the daytime, the sun's light is so bright that we cannot see them.

Observing the night sky.

For homework, look into the sky on the next cloudless night. Try to find the constellations in the picture. Also look for a wide band of white. This is the Milky Way — our galaxy. If you live in a city, it may be hard to see all the stars. There is too much light from street lamps etc. Remember to look for the different constellations next time you leave the town. Talk about what you have seen when you come back to class.

C. The Solar System

Our earth is shaped like a ball. It goes round the sun. It is a *planet*. A planet has no light of its own, but goes round the sun. Its path round the sun is called an *orbit*. There are other planets which orbit the sun. Some are nearer the sun than the earth. Some are further away. Our sun and its planets are called the *Solar System*.

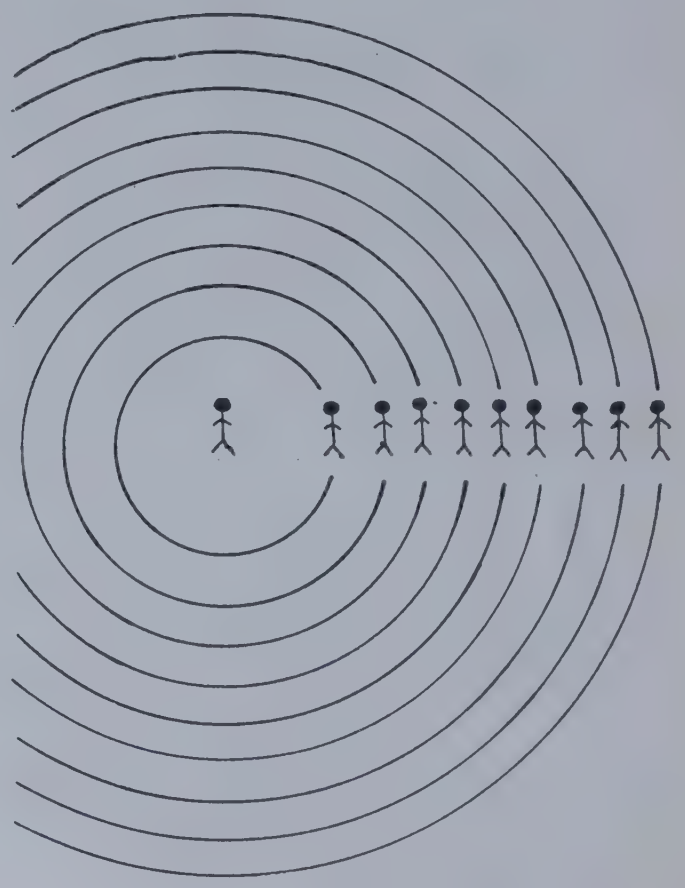


Solar System

There are nine main planets, but recently scientists have discovered more. They are millions and millions of miles away in the darkness beyond Pluto. Each planet spins on its axis like the earth. The earth spins round once every 24 hours. Some planets spin more quickly. Jupiter spins round once every 10 hours. Some spin much more slowly.

Venus spins round once every 243 Earth days. Just imagine living in darkness for 121 days!

The planets also take different amounts of time to orbit the sun. You will see why if you go outside. One child should act as the



sun and stand in one place. Nine children should act as the planets. They should stand in a straight line, pointing away from the sun. Then, each one should walk at the same speed around the sun. The further you are from the middle, the longer it takes.

Now answer these questions:

1. Which child took longer to orbit the sun — the child nearest the middle or the child furthest away from the middle?
2. Guess which takes longer to orbit the real sun — Venus or Pluto?
3. Guess which takes longer to orbit the sun — Saturn or Jupiter?
4. Which has a longer day — Jupiter or Earth?
5. Which has a longer day — Earth or Venus?
6. What do we call the sun and its planets?

D. Astronomy

Astronomy is the study of the stars and space. For many thousands of years, people thought that the earth was flat. They thought that it was in the middle of space and that all the stars went round it every day.

About 2 350 years ago, in the 4th century BC lived a Greek thinker called *Aristotle*. He thought that the world was not flat, but round.

In the 2nd century AD lived an Egyptian called *Ptolemy*. He said that the earth was in the middle of space. He thought that the sun and the stars all went round the earth. For hundreds of years nearly everyone thought he was right.

One of the greatest early astronomers was *Aryabhata I*. He lived in India in the 6th century AD. He was also a very great mathematician. He worked out that the world is round and that it spins on its axis. He also worked out that there are 365.3 days in a year.

In the 12th century, lived another great Indian astronomer and mathematician, *Bhaskara II*. He made detailed maps of the stars in the sky.

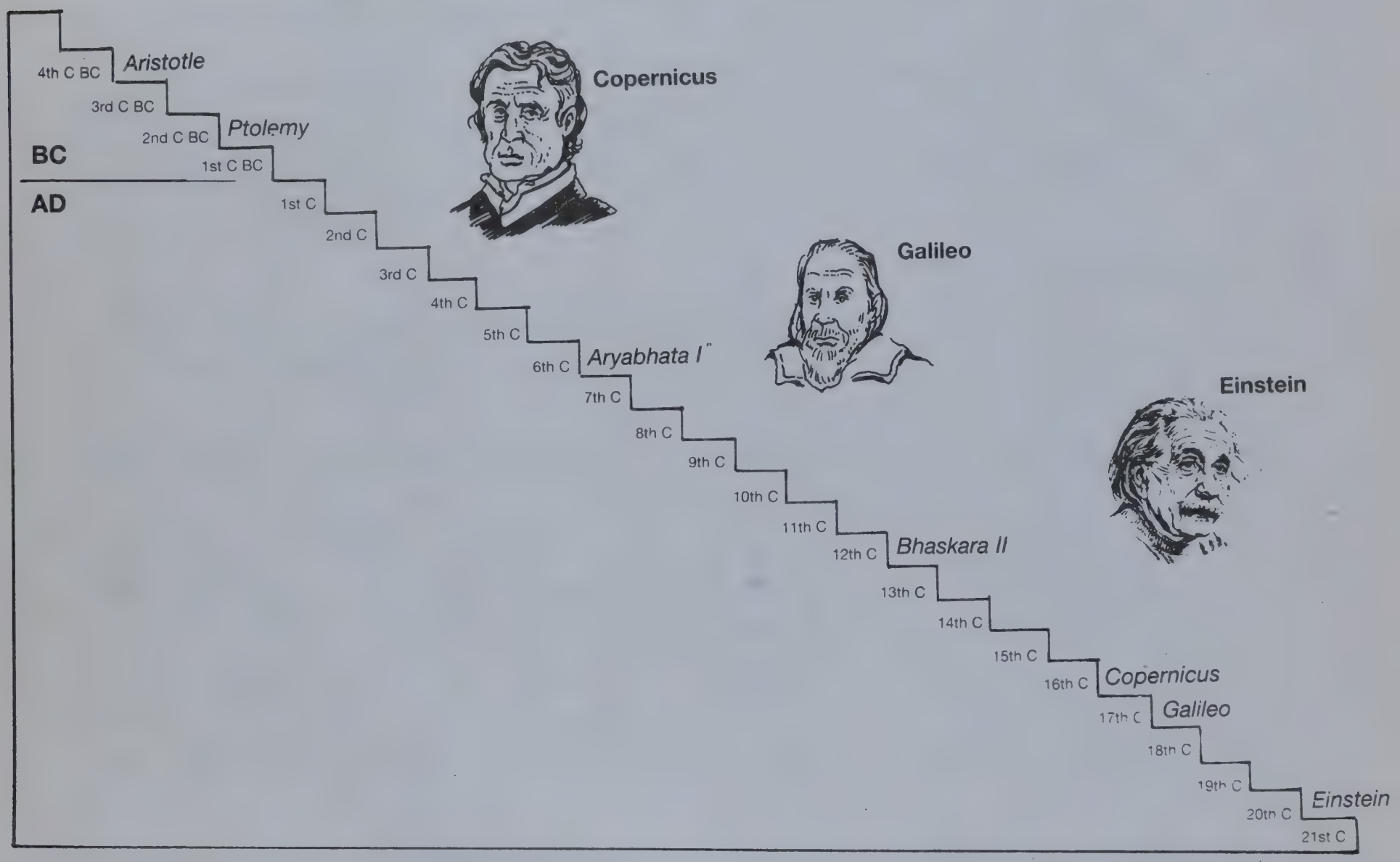
In the 16th century, lived the Polish astronomer *Copernicus*. He realised that the world is round and spins on its axis. Aryabhata had already discovered this, but probably Copernicus had not heard of Aryabhata. He also realised that the earth goes round the sun. Because of his ideas, people first tried to sail around the world.

Before this, most people believed that if you went in a straight line, you would fall off the earth.

The old idea of flat earth

In the 17th century lived *Galileo*, an Italian astronomer who first used a telescope. He proved that Aryabhata and Copernicus were right. He also discovered that Jupiter had moons and that there were mountains on the moon.

In the 20th century lived the German scientist, *Albert Einstein*. He knew that it takes thousands of years for the light of the stars to reach us. So he said that if you could travel faster than light, you could go backwards in time. But if you really want to understand Einstein, you will have to become a scientist yourself !



E. The moon

A moon is a *natural satellite*. A satellite is anything which goes round a planet. The earth has one moon. It orbits the earth about every 28 days. Some planets have many moons. A moon has no light of its own. It reflects the light of the sun—like a mirror.

A man-made satellite is an *artificial satellite*. For example, INSAT 2B, which gives us T.V. pictures and weather photos, is an aftificial satellite.

Our moon is smaller than the earth and much much smaller than the sun. But it is also much nearer to us than the sun. This is why the sun and the moon look the same size.

Sometimes we see the side of the moon which is away from the sun. We see the side of the moon which has night. Then we can only see a thin line of light. This is a *new moon* or *Amavasya*.

Sometimes we see the side of the moon which faces the sun. We see the side of the moon which has day. Then it seems big and round. This is a *full moon* or *Purnima*.

It takes about 28 days for the moon to orbit the earth, so we have a full moon every 28 days. This diagram shows how the moon changes shape over the month. These changes are called the *phases* of the moon.

Position of sun, earth and moon	How the moon appears to us
sun moon earth	We cannot see the moon when it is like this. When we can see just a little, it is called a New moon
	Crescent moon
	Half moon
	Three-quarter moon
	Full moon
	Three-quarter moon
	Half moon
	Crescent moon

F. Facts and figures about the planets

Planets	Average distances from the sun	Diameter (distance across)	Length of Year	Moons
Mercury	5 80 00 000 km	4 870 km	88 Earth days	none
Venus	10 75 00 000 km	12 100 km	225 Earth days	none
Earth	15 00 00 000 km	12 742 km	365 Earth days	1
Mars	22 78 00 000 km	6 790 km	687 Earth days	2
Jupiter	78 04 20 000 km	1 42 500 km	11.9 Earth years	16
Saturn	1 43 10 00 000 km	1 20 000 km	21.1 Earth years	24
Uranus	2 87 70 00 000 km	52 000 km	84 Earth years	15
Neptune	4 48 60 00 000 km	50 000 km	165 Earth years	2
Pluto	5 93 00 00 000 km	6 400 km	248 Earth years	1

Look at the facts about the planets and then fill in the blanks :

1. The biggest planet in the Solar System is .....
2. The smallest planet in the Solar System is .....
3. .....has the most moons.
4. ..... and ..... have no moons at all.
5. It takes Mars .....Earth days to orbit the sun.
6. It takes Neptune ..... to orbit the sun.

Revision

I. Poor Chandra is in a muddle. All his answers are wrong! Can you make them right?

1. *Astronomy is the study of butterflies.*
2. *A galaxy is a kind of chocolate.*
3. *The earth orbits the sun means that the sun goes round the earth.*
4. *A planet is a plant which grows in space.*
5. *The moon is an artificial satellite.*
6. *A T.V. satellite is a natural satellite.*
7. *The Solar System is a way of understanding computers.*

II. Here are some other people with problems. Can you help them?

1. Raju is a sailor at sea on a cloudless night. If he sails north he can get home. How can he find out which way to go?
2. Bleepoobeng is from the faraway planet Plink. He can live at any temperature and does not need air. But he likes to sleep for 121 days and then to be awake for 121days. Which planet in the Solar System do you think he would like best?
3. Tootlepip is from the planet Darkice. She hates light and heat. Which planet in the Solar System do you think she would like best?
4. XY729 is from the planet Zoom. It's 5 minutes past 2 and she must be at a wedding at 2 o'clock. How fast must she travel to get there on time? (Remember Einstein!)

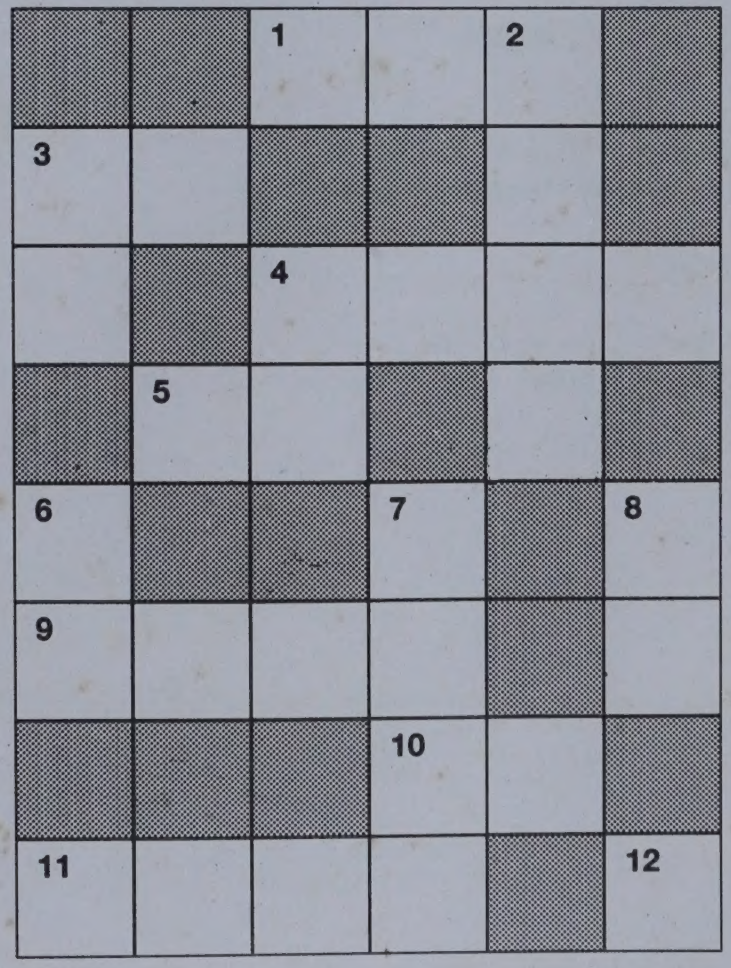
III. Here is an astronomical cross-numberpuzzle! Don't use any words. All the answers are numbers. The table on page 88 F will help you with some of the answers. Remember that there are six noughts in a million.

Clues across

1. Saturn's year is .....Earth years.
3. It takes the moon .....days to go round the earth.
4. Pluto is .....million km from the sun.
5. It takes Jupiter .....hours to spin on its axis.
9. Aryabhata worked out that Earth's year is .....days long.
10. Uranus is .....thousand km in diameter (across the middle).
11. Mars is ..... km in diameter.
12. Neptune has ..... moons.

Clues down

2. Saturn is ..... million km from the sun.
3. It takes the earth .....hours to spin on its axis.
4. Neptune is .....thousand km in diameter.
6. The earth is 150 million km or .....million miles from the sun.
7. Aristotle lived .....years ago.
8. Jupiter has ..... moons.



IV. Extension work

Imagine that you are an astronaut. You have made a journey into space. Tell the exciting story, beginning with the countdown to blast-off of the rocket. End with your return to the earth.

To all the children and teachers of Srujana School

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